Programs of NEXT MONTH'S

Coordinated Mechanical Meetings

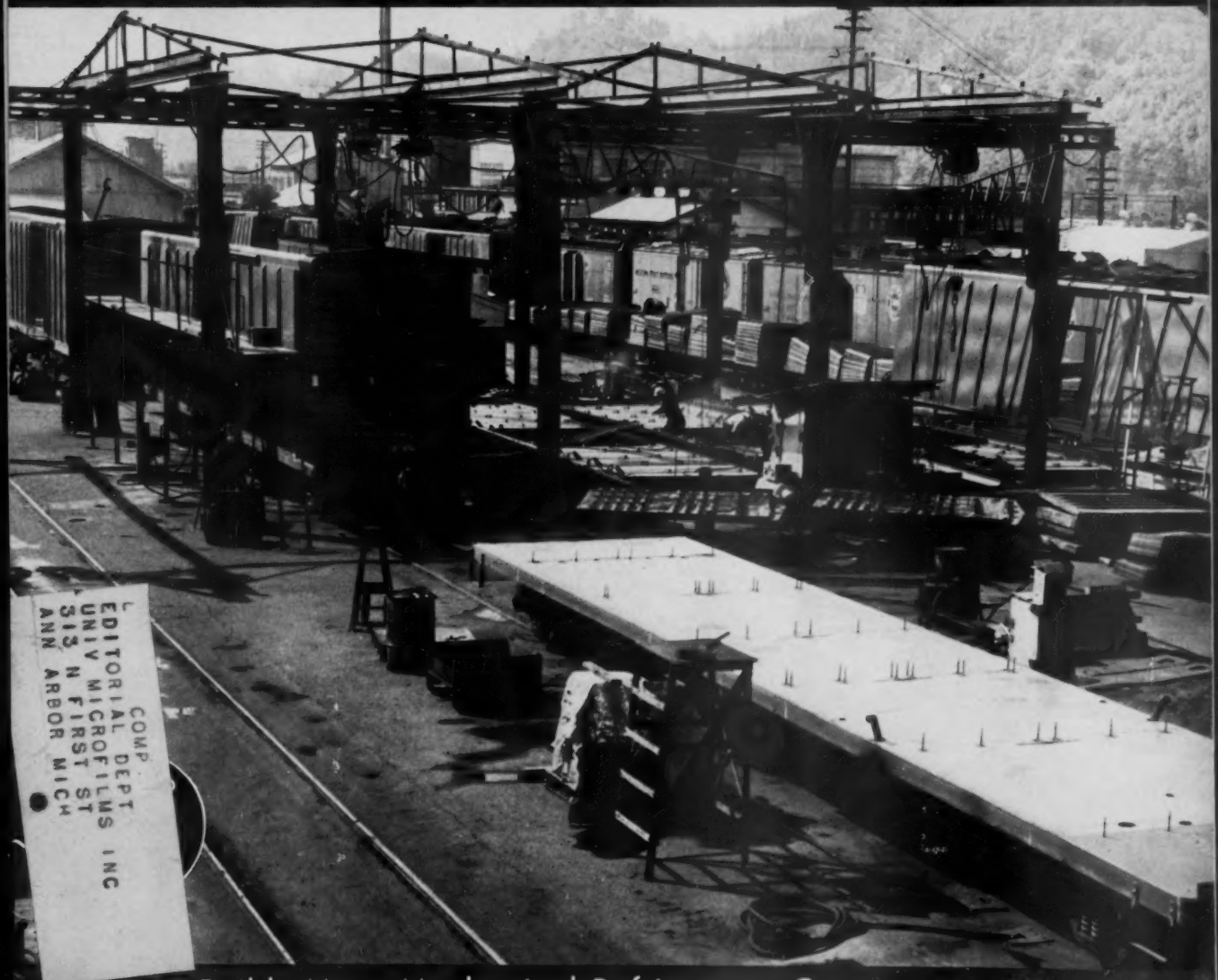
.. page 5

RAILWAY

LOCOMOTIVES AND CARS

A SIMMONS BOARDMAN TIME-SAVER PUBLICATION

AUGUST 1960



PFE Builds More Mechanical Refrigerator Cars . . . page 29

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RAILWAY
LOCO-MOTIVES AND CARS

America's Oldest Trade Paper
August 1960—Vol. 134, No. 8

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REPORT FOR AUGUST

Coordinated Associations Meeting in September

P. M. Shoemaker, president of the Delaware, Lackawanna & Western, will be the speaker at the Coordinated Mechanical Associations luncheon honoring all railroad presidents at 12 noon, Tuesday, September 13. The meetings of the individual associations—Air Brake, Car Department Officers', Locomotive Maintenance Officers', and Railway Fuel and Operating Officers—will begin on Monday, September 12, in the Hotel Sherman, Chicago. Their programs are as follows.

Air Brake Association

MONDAY, SEPTEMBER 12

10 a.m.

President's address.

Address—E. F. Tuck, chief mechanical officer, St. Louis—San Francisco.

Condemning Gages for the D-22-A and D-24 Control Valves and Universal Valves —Pittsburgh Air Brake Club.

Development of a Superior Brake Cylinder Lubricant—Montreal Air Brake Club.

2 p.m.

Technique in the Use of Composition Shoes—C. M. Cabble, Jr., senior staff engineer, Westinghouse Air Brake Co.

Automation of Air Brake Testing—P. M. Brath, staff engineer, Westinghouse Air Brake Co.

Pressure Maintaining Feature of Braking —George Ferguson, air-brake supervisor, Pennsylvania.

6-N.R. Type Distributing Valves—Donald E. Whitney, general air-brake supervisor, Great Northern.

TUESDAY, SEPTEMBER 13

9 a.m.

Fundamentals of Pneumatic Brake Calibration—H. N. Sudduth, chief engineer railway and pneumatic equipment, New York Air Brake Co.

No. 26-L Equipment Devices and Their Operation—St. Louis Air Brake Club.

No. 26-F Car Brake Equipment, Its Operation and Maintenance — Central Air Brake Club.

Multiple Uniting of 26-L, 24-RL and No. 6 Type Equipments—Manhattan Air Brake Club.

2 p.m.

Electro-Motive Division, GM, tour.

WEDNESDAY, SEPTEMBER 14

9 a.m.

My Experience with 24-RL Brakes on Locomotives — Harold Rausch, air-brake foreman, St. Louis—San Francisco.

Elections.

Question Box.

Committee reports.

Car Department Officers'

MONDAY, SEPTEMBER 12

10 a.m.

President's address.

Report — Committee on AAR Loading Rules.

Address—M. G. McInnes, executive vice-president, Erie.

2 p.m.

Report—Committee on Design, Mainte-

(*Continued on page* 10)

TIME SAVING IDEAS FOR AUGUST

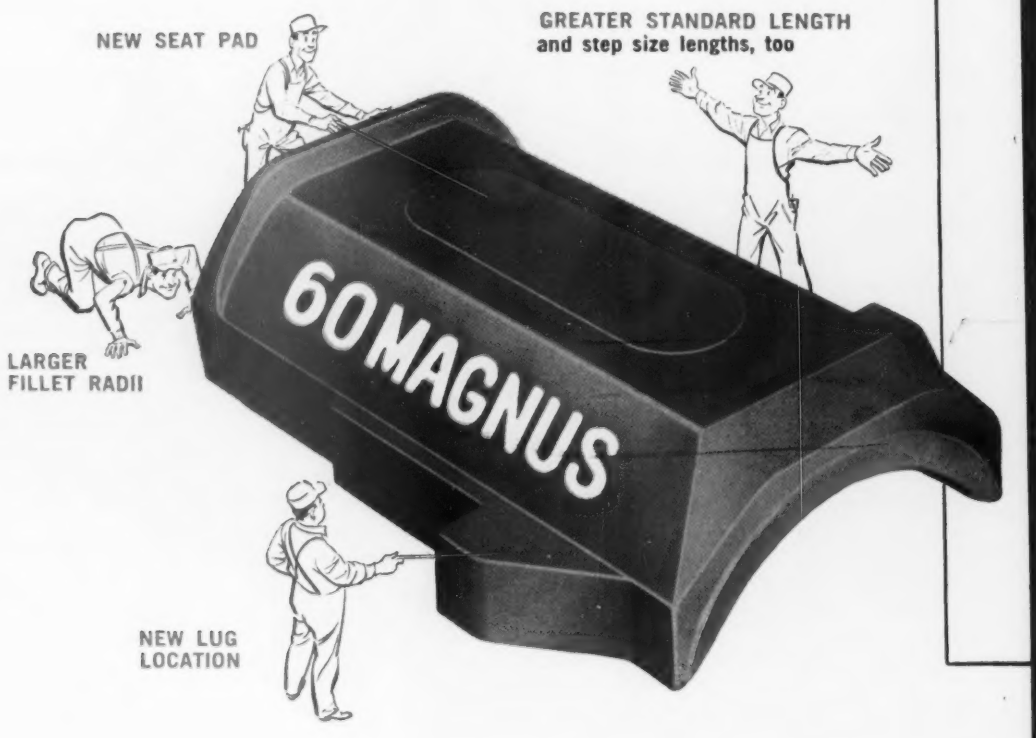
MOTIVE POWER AND CAR

ELECTRICAL

DEPARTMENTS

New AAR Standards give

IMPROVED OVERALL PERFORMANCE



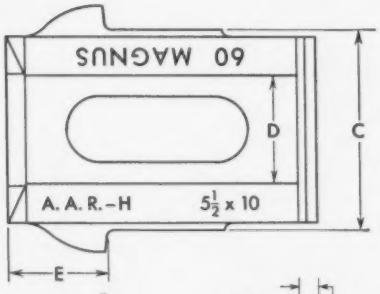
New raised back bearing design improves load distribution, reduces lateral play, balances thrust loads and reduces wiping at both fillets—promises a new high in solid bearing performance and economy

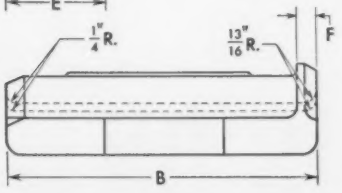
IN THE NEW AAR standard bearing design, there are a number of important changes which will improve overall performances on both new and old cars. The principal design changes and their advantages are as follows.

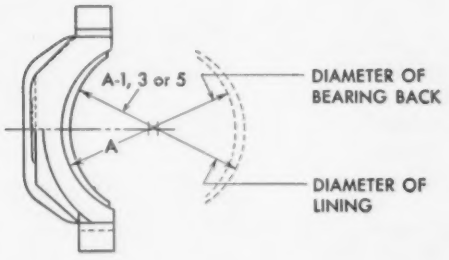
A new raised seat pad on the bearing back gives controlled radial load distribution—puts preferential loading in the middle of the journal where lubrication is more abundant and uniform at all times. This lowers operating temperatures, builds up bearing miles.

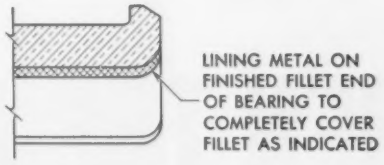
Magnus Solid Bearings

NEW A. A. R. STANDARD JOURNAL BEARINGS









CLASS	SIZE JOURNAL	DIMENSIONS IN INCHES														
		A	Std.	Step Sizes		Std.	Step Sizes		C	D	Std.	Step Sizes		Std.	Step Sizes	
			A-1	A-3	A-5	B-1	B-3	B-5			E-1	E-3	E-5	F-1	F-3	F-5
C	5 x 9	5.015	5.015	4.890	4.765	$8\frac{3}{4}$	$8\frac{27}{32}$	$8\frac{15}{16}$	$5\frac{3}{8}$	$3\frac{1}{4}$	$2\frac{29}{32}$	$2\frac{15}{16}$	$2\frac{31}{32}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{13}{16}$
D	$5\frac{1}{2}$ x 10	5.515	5.515	5.390	5.265	$9\frac{3}{4}$	$9\frac{27}{32}$	$9\frac{15}{16}$	$5\frac{7}{8}$	$3\frac{1}{4}$	$3\frac{13}{32}$	$3\frac{7}{16}$	$3\frac{15}{32}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{13}{16}$
E	6 x 11	6.015	6.015	5.890	5.765	$10\frac{3}{4}$	$10\frac{27}{32}$	$10\frac{15}{16}$	$6\frac{7}{8}$	$3\frac{5}{8}$	$3\frac{15}{32}$	$3\frac{1}{2}$	$3\frac{17}{32}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{13}{16}$
F	$6\frac{1}{2}$ x 12	6.515	6.515	6.390	6.265	$11\frac{3}{4}$	$11\frac{27}{32}$	$11\frac{15}{16}$	$7\frac{3}{8}$	$4\frac{1}{8}$	$3\frac{31}{32}$	4	$4\frac{1}{32}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{13}{16}$

MAGNUS
METAL CORPORATION

Standard bearings are increased ¼" in overall length, giving greater bearing area and reduced lateral play. Step sizes are also increased in length (see above), tending to reduce lateral play on worn journals. This, together with new lug location, gives more balanced thrust loading than standard bearings have ever had before. Fillet radii have been increased at both ends of the bearing for further reduction in end wear and reduced wiping of the babbitt at both fillets.

These design modifications should help establish a new high in the performance of low-cost solid bearings. For further information write to Magnus Metal Corporation, 111 Broadway, New York 6, or 80 E. Jackson Blvd., Chicago 4, Ill.

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3 Expanded metal bundle. Combines the best braking characteristics of mild steel and special cast iron. Reinforces basic brake shoe structure. Lengthens shoe life.

4 Clinched lug strap. When teamed with Brake Shoe Lockey, reduces brake head wear and breakage from vibration. Big posts give greater bearing area, reduce brake head wear. Clinched strap results in higher safety factor.

5 Ferrous materials developed by metallurgical research specifically for brake shoe service. Combine long life, desirable friction, freedom from wheel-damaging characteristics.

6 Quality throughout! —one of the big reasons why our brake shoes have become the standard of braking performance on American railroads.

Car Department Officers'

(Continued from page 5)

nance and Upgrading Freight-Car Equipment.

Report—Committee on Interchange and Billing for Car Repairs.

TUESDAY, SEPTEMBER 13

9 a.m.

Report—Committee on Rail-Road Transportation.

Address—E. C. R. Lasher, president, North American Car Corp.

Report — Committee on Light Repair Tracks and Train Yard Operation.

2 p.m.

Report—Committee on Car Lubrication.

Comments—W. M. Keller, vice-president (research), AAR.

Report — Committee on Wheels, Axles and Wheel Shop Practices.

WEDNESDAY, SEPTEMBER 14

9 a.m.

Report — Committee on Passenger Car Maintenance, including Air Conditioning and Heating.

Report—Committee on Maintenance and Servicing Refrigerator Cars.

Report—Committee on Painting.

Miscellaneous reports.

Election of Officers.

Railway Fuel & Operating Officers

MONDAY, SEPTEMBER 12

10 a.m.

President's address.

Transportation — J. C. Grissom, vice-president and general manager, Louisville & Nashville.

Report of secretary.

Safety on the Railroad—H. C. Ekstam, supervisor of safety, New York Central.

Compliance with Signal Rules — L. S. Randolph, supervisor locomotive performance, New York Central.

2 p.m.

Panel discussion — Evolution of Train Handling.

Report on Economy in Use of Fuel Oil.

TUESDAY, SEPTEMBER 13

9 a.m.

Public Relations—S. C. Scholl, director personnel, Louisville & Nashville.

Report on Train Line and Air System Defrosting.

Panel Report—Freight Loss and Damage Prevention.

Benefits and Economy of Automatic Independent Sanding—A. H. Glass, chief power and fuel supervisor, Chesapeake & Ohio.

Report on Economical Utilization of Power.

2 p.m.

Comparison between Electric and Diesel Locomotives—W. P. Primm, road foreman of engines, Pennsylvania.

Importance of Handling Traffic—Railroad and shipper speaker.

Advance Horsepower on Diesel Locomotives—N. J. Hochanadel, electrical engineer, Alco Products, Inc.

Panel Discussion—Instructions and Demonstration of Air-Brake Handling to the Engineer by Road Foreman.

WEDNESDAY, SEPTEMBER 14

9 a.m.

Panel discussion — Diesel Failures — Causes and Remedies.

Official business and open forum.

Locomotive Maintenance Officers'

MONDAY, SEPTEMBER 12

10 a.m.

President's address.

Address—F. B. Rykoskey, general superintendent motive power and equipment, Baltimore & Ohio.

Fuel and Lube Oil. Topic: Relation of fuel and lube oil to diesel engine performance.

2 p.m.

Steam Generator and Water Treatment. Topic: Relation of controls to steam generator performance.

Diesel-Electrical Maintenance. Topic: Maintenance of control equipment to prevent road delays.

TUESDAY, SEPTEMBER 13

8:30 a.m.

Diesel Engine Maintenance. Topic: Upgrading diesel engines for extended economical service life.

Address—P. F. Pfahler, assistant director, Bureau Safety & Service, ICC.

Diesel Mechanical—Other. Topic: Problems of truck and related parts maintenance.

2:30 p.m.

Tours of AAR Laboratory and plant of Electro-Motive Division, GM.

WEDNESDAY, SEPTEMBER 14

8:30 a.m.

Shop Equipment. Topic: Equipment for efficient engine rebuilding.

Diesel Material Reconditioning and Control. Topic: New techniques in reclamation of diesel locomotive parts.

1:30 p.m.

New Developments in Motive Power Maintenance. Topic: New developments in motive power.

Orders and Inquiries for New Equipment

Placed Since Closing of July Issue

Freight Cars

GRAND TRUNK WESTERN. *Ortner.* 75, 70-ton steel flat cars. For late fourth quarter delivery.

UNION TANK CAR. *Company shops.* 12 tank - 1120-400-W, 30,000 gal, 85 ft. For lease to Baton Rouge Refinery of Esso Standard, Division of Humble Oil & Refining Co. For September delivery.

Passenger Cars

ROCK ISLAND. *St. Louis Car.* 25 baggage. Cost, $1,600,000. Delivery scheduled for December.

Notes and Inquiries

New York City Transit Authority has taken delivery of 110 new subway cars built by ACF and will receive an additional 100 cars between August and December. Each car contains 2,500 lb of Alcoa aluminum.

Venezuelan Government has made a preliminary agreement to purchase the New Haven's three lightweight passenger trains—the "Roger Williams," "Dan'l Webster," and "John Quincy Adams"—for $3.6 million. Final transaction awaits approval of Venezuela's budget which includes funds for this purpose.

Mechanical Division Committees Consolidating

At the recent annual meeting of the AAR Mechanical Division J. W. Hawthorne, chief mechanical officer, Atlantic Coast Line, succeeded S. M. Houston, general superintendent, mechanical department, Southern Pacific, as chairman of the Mechanical Division for a two-year term. J. A. Welsch, general superintendent motive power, Illinois Central, is now vice-chairman of the division.

Ten Mechanical Division committees are being consolidated into five, the General Committee of the division announced last month. This is being done to conform with a general simplification of organization throughout the Association of American Railroads.

A new Committee on Wheels and Axles will combine the functions of the two committees which used to cover these topics individually. The Committee on Geared Hand Brakes will be absorbed into the Committee on Brakes and Brake Equipment. The Committee on Passenger Cars and the Committee on Car Construction will be consolidated to form a Committee on Freight and Passenger Car Construction. The Special Committee on Forest Products Loading is being absorbed by the Committee on Loading Rules, but will continue as a separate sub-committee. The Committee on Locomotives and the Committee on Lubricants and Fuel for Diesel Locomtives are being consolidated to form a Committee on Locomotives and Locomotive Lubricants and Fuel.

1961 RSMA Exhibit Cancelled

Exhibits planned at Chicago's new Exposition Center in conjunction with the June 1961 AAR Mechanical Division and Electrical Section meetings have been cancelled by the Railway Supply Manufacturers Association. RSMA says future exhibit plans are indefinite.

The September 10-13, 1961, Coordinated Mechanical Associations meetings in Chicago will be supported by ARSA exhibits and track show. The Purchases & Stores Division has changed its meeting dates from June to September to take advantage of the exhibits.

Warning System for Standby Heaters

Diesel engine standby heater failure warning system alerts personnel in remote areas where locomotives are temporarily parked overnight if engine water temperature falls below 100 deg F, or if commercial power fails. At 27 locations the Northern Pacific parks diesel locomotives overnight or over weekends. These engines were formerly parked in heated buildings with an attendant.

Engine water heaters have been installed, which, along with an alarm system, operate off commercial power. If the power fails or engine water temperature falls, a bell rings at the locomotive site and at a nearby depot, enginehouse or railroad man's home. The person alerted, if not a mechanical department employee concerned with locomotives, calls someone who goes to the engine to ascertain the trouble and remedy it.

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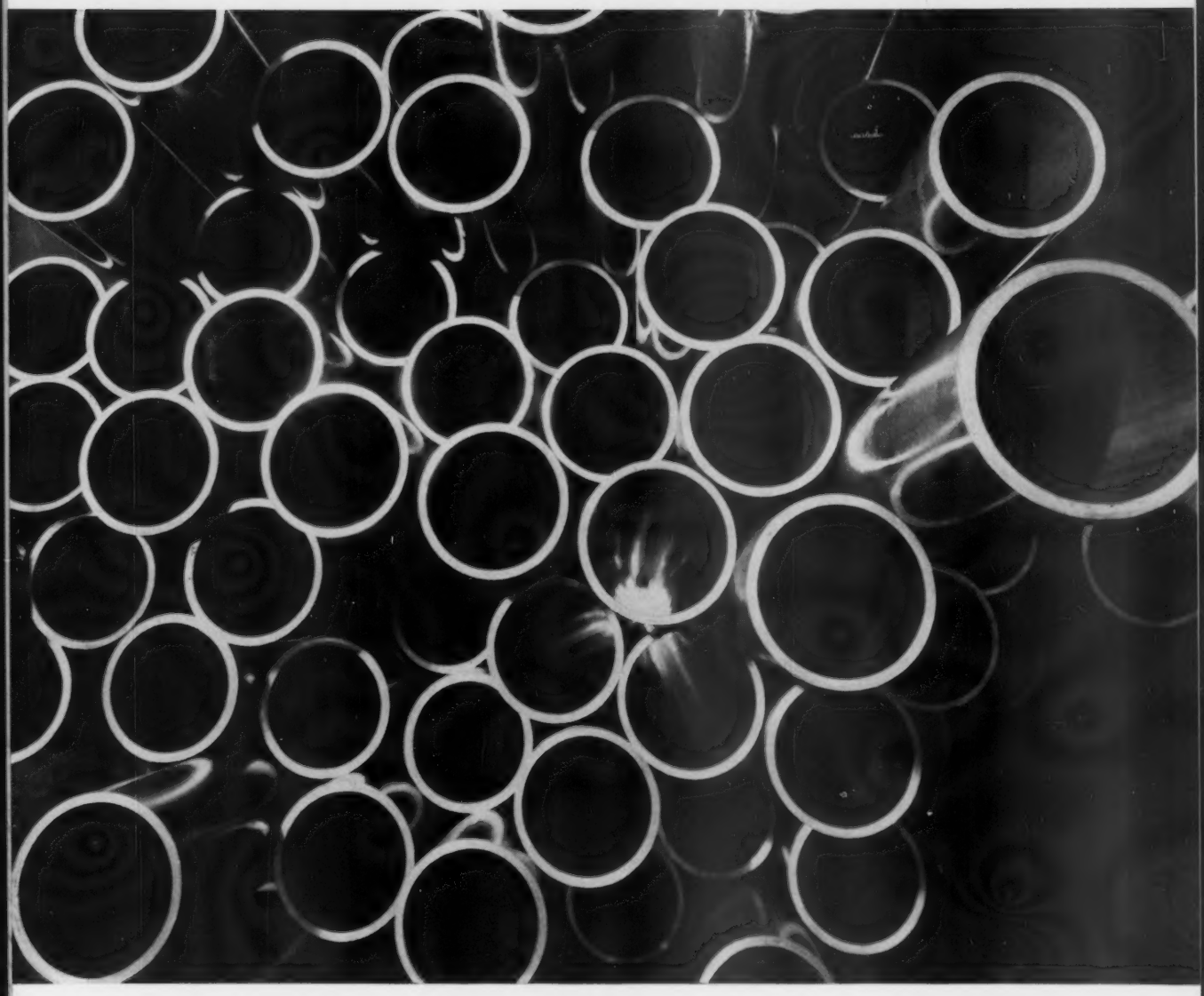

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USS National Electric Welded Mechanical Tubing is an ideal load-carrying member. It resists bending stresses equally in all directions and gives you a superior cross section. It absorbs and localizes shock. In torsion, it provides better material distribution. And for a given weight, mechanical tubing withstands more load than other sections.

USS National Electric Welded Mechanical Tubing is available in cold-drawn or hot-rolled sizes ⅜″ thru 5½″ and in wall thicknesses .035″ to .250″. It can be obtained from National Tube Distributors located throughout the country. They will gladly show you how to use USS National Welded Mechanical Tubing in your next application. *See your USS National Tube Distributor.*

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Launcher Car for Minuteman ICBM

Engineers at the American Car & Foundry plant at Berwick, Pa., have completed yard and short-run road tests of a pre-prototype "shockproof," "three-way-stretch" launcher car for the Minuteman ICBM. The three-stage, solid-fuel-propelled ICBM and its launching equipment are under development for the Air Force Strategic Air Command. The car is the result of a joint project between the American Machine & Foundry Co. and ACF. According to ACF, its "three-way-stretch" provides vertical, longitudinal, and transverse cushioning to a degree never before achieved in a railroad car.

The car looks like a combination flat car and tank car, with a number of steel containers fastened to its outer edges. The huge tank and other containers, depending on where they are located, are filled with water, sand, or concrete to simulate actual weight and center of gravity of the proposed missle-loaded car. Because of ACF hydraulic shock absorption, following impact, the superstructure can move as much as plus or minus 15 in. in relation to the car's center sill without damage. Conventional passenger-car draft gear provides another 4½ in. of cushioning in either direction. There are no return coil springs on the cushioning unit. Instead, a compressed air reservoir has been introduced for restorative action that returns the car body to neutral following impact.

Each of the special trucks has six wheels (three axles). Their air-coil spring suspension isolates the shock of impact and permits the cargo (a Minuteman missile) to ride shockproof. The use of air springs keeps coupler height constant within AAR requirements. In the eventual Minuteman train a power car will supply electrical energy that will, in turn, drive a compressor on the control car.

The car has a length over couplers of 88 ft; width over sides, 9 ft 9 in., and height to top of side sills, 4 ft. 7 in. The wheels are 33 in. in diameter.

Versatile Swiss Electrics

Four electric trains which will operate from contact systems providing four different kinds of power are now being built by the Swiss Federal Railways. Each train will consist of a central power car with three coaches. There will be an operator's position at each end of the train.

The trains, which are scheduled for delivery early in 1961, will be used in Trans-Europe (TEE) service. In France and the Netherlands, the trains will operate from a 1,500-volt, d-c contact system. In Italy and Belgium, the power will be 3,000 volts, d-c; in Switzerland, Germany, and Austria, it will be 15,000-volt, 16-2/3-cycle a-c power, and on recently electrified French lines, it will be 25,000-volt, 50-cycle, a-c power.

All traction motors will be d-c motors, and a-c power will be converted to d-c by silicon type rectifiers. Diesel-electric trains which are being used in this service will be replaced by the electric trains.

Ten switching locomotives, similarly equipped, are also scheduled for early 1961 delivery. They will employ mercury-arc instead of semi-conductor type rectifiers.

Electrification of all lines of the Swiss Federal Railways was completed on May 30, 1960. This was accomplished by replacing steam power with electric on the line which runs from Cadenatto to Luino, a distance of 20 miles.

Miscellaneous Publications

TEST OF DIESEL ENGINE LUBRICATING OIL.—Mechanical Research Report OR-12 covers a service test of Ashland Oil & Refining Company's "NA-RE-CO RX1243 Diesel Engine Lubricating Oil" conducted by the Test Department of the Pennsylvania. *F. H. Stremmel, secretary, Mechanical division, Association of American Railroads, 59 East Van Buren st., Chicago 5. To members $2.00 each; to other than members, $3.00 each.*

Letters to the Editor

"Two Birds"

TO THE EDITOR:

Your article, "Two Birds with One Stone" (RL&C, March 1960, p. 44), has both a humorous touch and practical hints which are well presented. It shows the coordination and good will of the personnel of your railways . . .

A. Valle. A.
Mexico City, Mexico

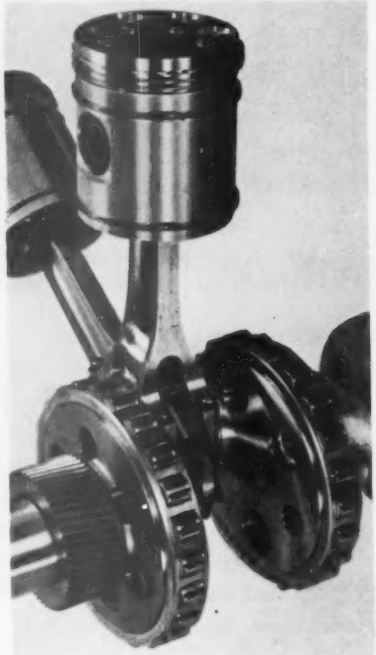
Maybach Diesel Engine

TO THE EDITOR:

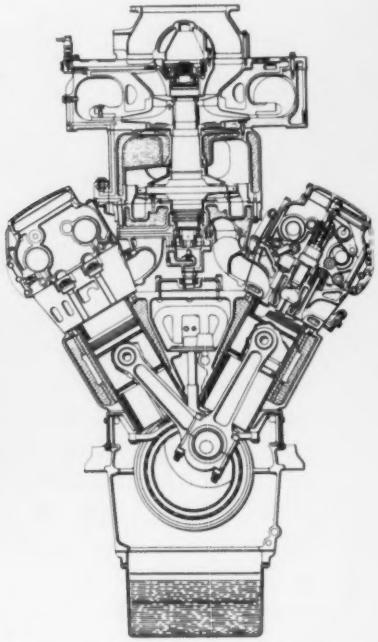
In your description of the Maybach diesel to be used on the Southern Pacific and the Denver & Rio Grande Western locomotives (June 1960, p. 35), you mention a tunnel crankcase and roller main bearings. How is it possible to use roller type main bearings on a diesel engine?

Puzzled Reader

[The "tunnel" is of large diameter which will accommodate these bearings. The bearings, themselves, are mounted on circular crank webs. According to the manufacturer, "This construction gives a stiff crankshaft with a high proportion of its total length available for the connecting rod bearings. It results in a rigid and strong crankcase and frame without any division at the crankshaft center line. There are no bolts or preserrated caps for the main bearings." The illustrations below show details of this construction.—Editor.]

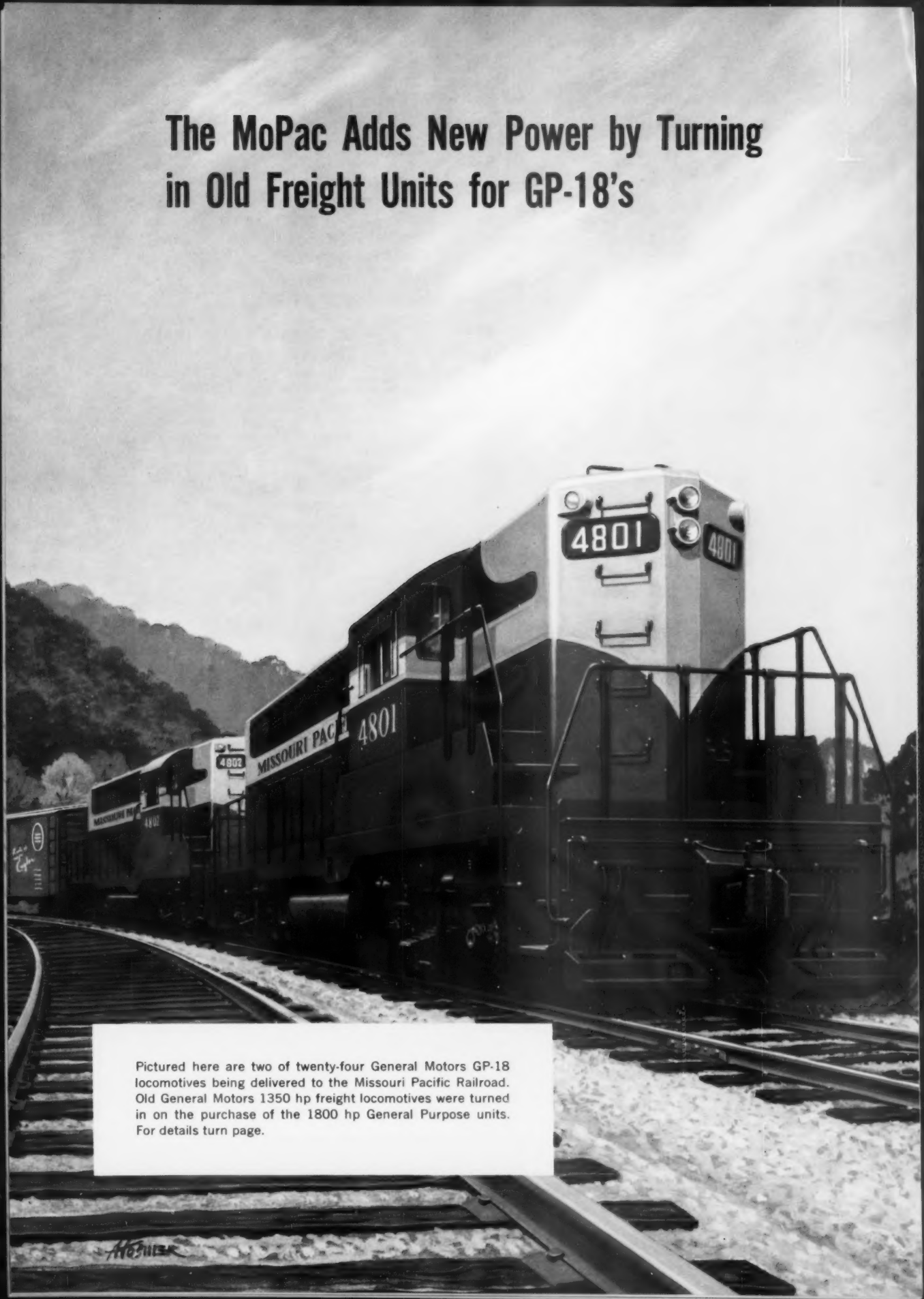


Fork-and-blade connecting rods are said to increase bearing area. Shaft has disc webs.



Cross-section of Maybach MD engine shows the tunnel type crankcase and roller bearings.

The MoPac Adds New Power by Turning in Old Freight Units for GP-18's



Pictured here are two of twenty-four General Motors GP-18 locomotives being delivered to the Missouri Pacific Railroad. Old General Motors 1350 hp freight locomotives were turned in on the purchase of the 1800 hp General Purpose units. For details turn page.

The new General Motors GP-18 . . . an 1800 horsepower General Purpose locomotive . . . features the new 567-D1 engine providing a 5 per cent improvement in specific fuel consumption and improvements in other components which, taken together, permit a 60 per cent reduction in scheduled maintenance compared with earlier GP models.

Locomotive Replacement on the MoPac

Taking advantage of the lower operating cost of today's General Motors locomotives, the MoPac is turning in twenty-four old FT freight locomotives on the purchase of an equal number of new-model GP-18's. The GP-18 incorporates improvements in all major components resulting from Electro-Motive's intensive research and development program . . . important advancements in performance and operating efficiency spanning the 17-year period (and five series of locomotive models) since the MoPac first took delivery of their FT's.

Working on a progressive, planned Locomotive Replacement Program, the MoPac is acquiring the units at much lower capital investment because of the turn-in value of the old locomotives.

The GP-18 units also provide an increase of 10,800 horsepower over the old units . . . the equivalent of *six additional locomotives.* Thus, the MoPac has additional capacity to haul more tonnage or run faster schedules with the same number of units.

The flexibility of the GP-18 model over the freight type locomotive provides for maximum utilization in a wide variety of service.

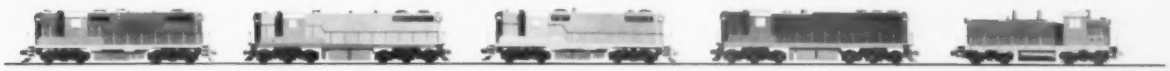
GENERAL MOTORS LOCOMOTIVES

ELECTRO-MOTIVE DIVISION · GENERAL MOTORS

LA GRANGE, ILLINOIS • *HOME OF THE DIESEL LOCOMOTIVE*

In Canada: General Motors Diesel Limited, London, Ontario

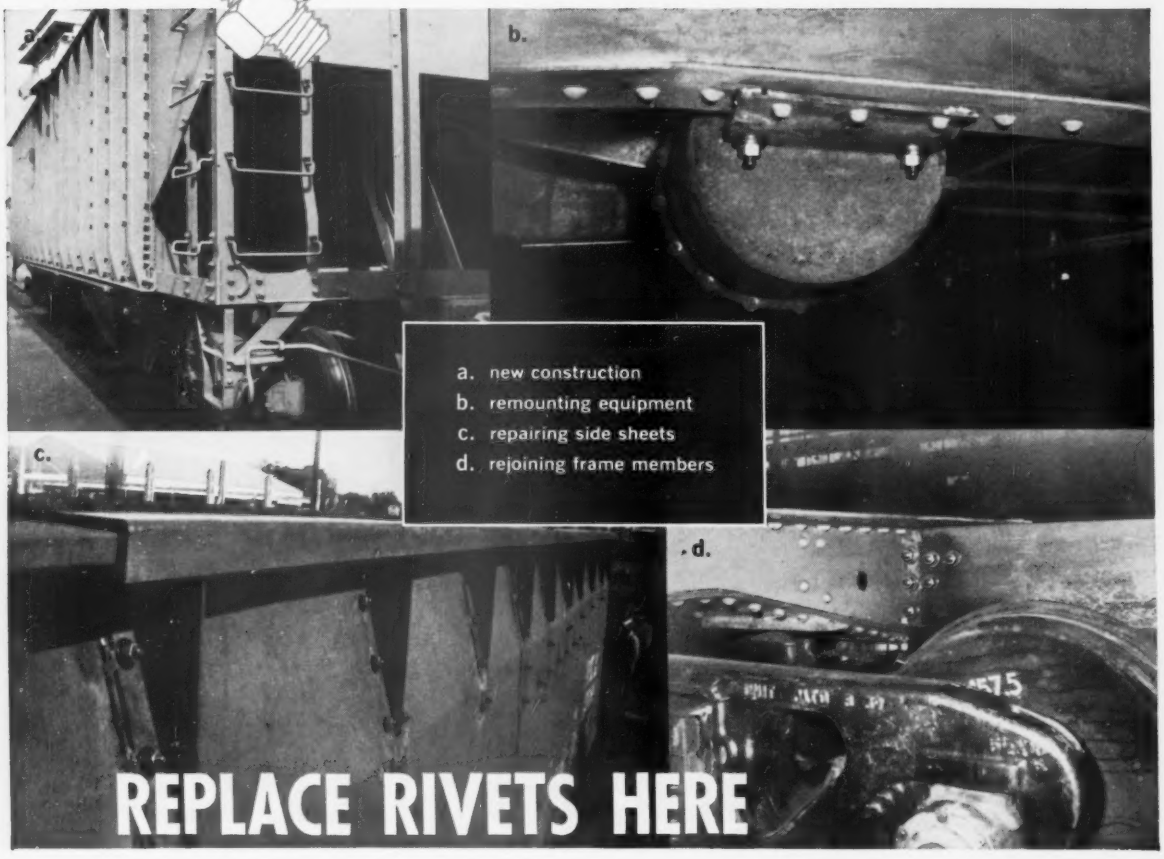
More power at less cost with General Motors great new line of locomotives—



1800 hp General Purpose GP-18 | 1800 hp Special Duty SD-18 | 2000 hp General Purpose GP-20 | 2400 hp Special Duty SD-24 | 1325 hp Road Switcher RS-1325

R B&W high strength bolts...

116th year



for faster, stronger construction and repairs

LOOK TO ANY PHASE OF CONSTRUCTION or repair and you'll find a place where RB&W High Strength Bolts are cutting costs for leading roads. For example, bolts are replacing rivets in repairing top chords and side sheets on gondola cars, refastening center and side sills, remounting loose auxiliary equipment such as air reservoirs, tanks and retainer valves.

Reason 1: stronger construction. High strength bolts exert more than *double* the clamping force possible with rivets. Bolted joints *stay* tight.

Reason 2: faster construction. In comparative test, a crew used bolts in 69 rivet locations in gondola cars, for a labor saving of $13.78. Though material cost increased $11.40, net saving was $2.38. You'll find that bolt installed cost is consistently less than rivet installed cost.

Reason 3: faster repairs – now, and in the *future*. Picture the time difference between simply unscrewing a nut, and burning out a rivet. When you add up the number of rivets that require replacement in *any* repair job, total time saving is considerable. Bonus: some jobs usually requiring shop attention can be *bolted* right on any repair track. Stock gets back on the road faster.

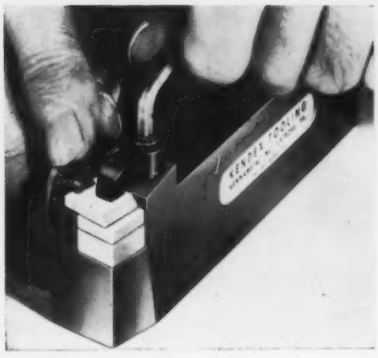
Road and shop tests by leading roads are proving the superiorities of RB&W High Strength Bolts. An RB&W engineer will be happy to tell you more. Meanwhile, send for Bulletin RR-1, or see catalog 1c/RB&W in the Modern Railroads Catalog file. Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, New York.

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

LOCOMOTIVES AND CARS **WHAT'S NEW** IN EQUIPMENT

Forged Equalizer Bars

The first forged equalizer bars for car truck assemblies to incorporate an integral snubber bracket are made of 1050 steel. The added strength of the one-piece forged equalizer and snubber design is expected to be of especial value on cars used to transport hazardous cargo, such as chemicals and combustible materials. The bars will be installed on freight cars being built by the Thrall Car Manufacturing Co. and on cars being modernized in the Albuquerque, N.M., shops of the Santa Fe. *Steel Improvements & Forge Co., Dept. RLC, 970 E. 64 st., Cleveland 3.*



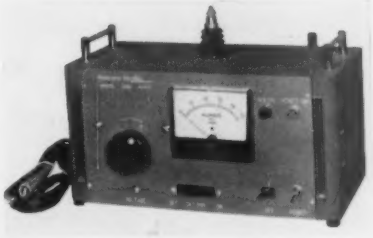
Metal-Cutting Tool

A new metal-cutting tool incorporates a mechanism for maintaining optimum machining conditions. It provides close control of the metal chips that are removed in machining operations with hard carbide throw-away inserts, permitting fine screw adjustment of chip-breaker plate position on Kendex tool holders to control chip form.

The adjusting mechanism consists of a screw brazed on the back edge of a hard carbide chip-breaker plate, and a knurled nut or dial to position the plate over the carbide cutting insert. The insert is a small square or triangular piece of carbide with three to eight indexable cutting edges. A clamp holds these parts on the holder during machining operations. When they are unclamped for indexing or replacing a cutting insert, the chip breaker assembly is held in position by the screw which engages the backing ledge of the holder. A spring under the knurled nut lifts the chip-breaker plate when the clamp is released.

The Dial-A-Breaker Kendex holder provides for easy adjustment of the chip-breaker, regardless of its position, as on semi-automatic machines and under conditions of close ganging of tools. The adjusting nut on top of the tool is exposed more than 180 deg for turning. The insert clamp can be loosened and tightened by an Allen wrench from the top or bottom of the holder.

The holders are vailable with positive or negative rake angles, either in right or left-hand styles, with triangular or square Kendex inserts. *Kennametal Inc., Dept. RLC, Latrobe, Pa.*



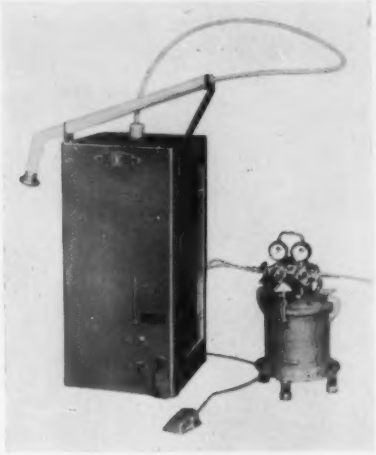
Portable A-C Dielectric Test Set

Outposts of the Hywatt Hypots line of portable a-c dielectric testers range from 1,500 v a-c to 10,000 v a-c at 1.0 kva, continuous duty ratings. Intermittent ratings are approximately twice the continuous ratings. Output voltage is continuously adjustable from zero to maximum, with a 4½-in. rectifier type kilovoltmeter connected directly across the high voltage output. A fast-acting magnetic circuit-breaker, with manual reset, operates when full kva rating is reached. The panel and cabinet are grounded. Operation is from 115-volts, single phase 50-60 c a-c, through a three conductor input lead with standard two-prong plug and ground clip. *Associated Research, Inc., Dept. RLC, 3777 W. Belmont ave., Chicago 18.*

Magnetic Particle Inspection Materials

Ready-to-use Magnaflux-Magnaglo- marials, in pressurized spray cans and plastic squeeze bottles, eliminate previous bulky containers and the problems of mixing to formula, or filling application devices. Set-up time to inspect complex parts is also reduced. The sealed dispensers keep out dust, moisture, and other contamination during storage.

The No. 14M Fluorescent Magnaglo Bath and the No. 9BM Magnaflux Bath are offered in 12-oz pressure spray cans. The No. 1 Gray Power is now available in plastic squeeze-bottle dispensers, each containing 1 lb of magnetic particles. Perforated top is designed for even powder dispersion with easy hand squeeze. *Magnaflux Corp., a subsidiary of General Mills, Dept. RLC, 7300 West Lawrence ave., Chicago 31.*



Electrostatic Hand Gun

A portable, high-speed, centrifugal type electrostatic hand gun, Model 10, applies both metallic and non-metallic paints and coatings. It utilizes the principle of electrostatics to charge and guide pre-atomized particles of coating material. The "wrap-around" created minimizes overspray. The gun is available either with a straight or 45 deg angle head, as well as in models that will apply three individual or mixed colors. It installs easily into existing systems, making possible quick color changes. It weighs 1-¾ lb, and the power supply, which weighs 94 lb, operates from a standard 115-volt,

single-phase source requiring no special heavy duty wiring. When used indoors, ventilation is needed only to remove solvent vapors. *Ionic Electrostatic Corp., Sales Engineering Div., Dept. RLC, 111 Monroe st., Garfield, N. J.*

Quick-Disconnect Terminal for Brushes

A quick-disconnect terminal assembly for brushes is said to facilitate brush replacement on electric utility equipment and on any motor or generator in which the brushes are difficult to reach. The assembly consists of a stationary clip, easily bolted to the machine, into which either one or two terminals can easily be snapped. *National Carbon Co., Division of Union Carbide Corp., 30 East 42nd st., New York 17.*

Molded Coils

Luxolene moisture resistant molded coils are said to be engineered especially for electrically controlled steam devices. Made of modified epoxy resin, the coil construction is one homogeneous mass. According to the manufacturer, Luxolene offers excellent resistance to distilled water, kerosene, 30 per cent sulphuric acid, ethyl alcohol and hydraulic fluids. *Central Equipment Co., Dept. RLC, 80 East Jackson blvd., Chicago 4.*

Journal Lubricator

The Accurate journal lubricator features a lid seal, fillet oil seal and wire securement. The lid seal prevents dirt from entering the journal box, and the fillet oil seal lubricates the fillet of journal and prevents loss of oil from rear of box. According to the manufacturer, the wire securement prevents shifting of the lubricator under impact. The silicon impregnated 100 per cent wool felt pad is said to reduce friction between felt and journal. It increases resistance of felt to disintegration from heat to approximately 400 deg F, and prevents possible journal seizure at minus 60 deg F. The spring steel frame maintains the pad in constant contact with the journal. The lubricator is AAR approved for test application in interchange. *Fullo Corp. Dept. RLC. 2610 Eastwood ave., Chicago 25.*

Inspection Instrument

Borescopes, instruments much like miniature periscopes, permit close inspection of otherwise impossible-to-see internal surfaces. The instruments are available in diameters from .93 in. to 2.5 in. and in working lengths from 3 in. to 72 ft. Different optical arrangements are available to provide illuminated vision at right angles, straight forward, forward at an oblique angle, or rearward at an oblique angle. *National Electric Instrument Div., Engelhard Hanovia, Inc., Dept. RLC, 91-21 Corona Ave., Elmhurst 73, N.Y.*

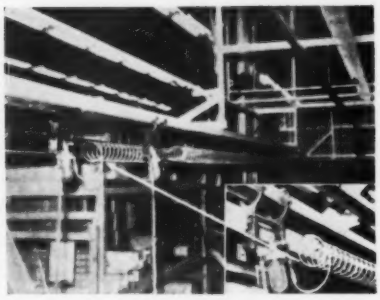
Dry Lubricant Stick

The Molykote lubricating stick permits easy application of a lubricating film to cutting and shaping tools, sliding areas of small and medium size machine parts, or wherever metallic dry friction occurs on sliding surfaces. It is an extreme-pressure molybdenum disulfide dry lubricant, resin bonded for greater strength. To apply, the stick is just rubbed firmly over cleaned surface.

The stick can be formed in any desired size for use as an element in the bearings of small machines, ways and light equipment undergoing oscillating movements. Slide boxes contain five or ten sticks. *Alpha-Molykote Corp., Dept. RLC, 65 Harvard ave., Stamford, Conn.*

Power Tool

The Size 808 Impactool will handle work up to ⅝-in. bolt size. It is 7¼ in. long, with a side to center distance of 1½ in., and weighs only 8-⅞ lb. It delivers 1,100 impacts per minute and has a free speed of 6,000 rpm. The standard square driver of the tool measures ⅝ in. across flats; ¾-in. and ½-in. square drivers are also available. *Ingersoll-Rand Co., Dept. RLC, 11 Broadway, New York 4.*



Retractable Air Hose

The S12 Synflex self-storing air hose has a ⅜ in. inner diameter. With a total hose length of 25 ft, it has an extended working length of 20 ft and retracts into a compact storage coil of only 5 in. outer diameter, 9 in. long. The hose is made from a special nylon formulation; is impervious to oils, and is supplied with reusable couplings that are easily assembled and a spring guard to prevent crimping. The original self-storing hose was ¼ in. *Synflex Products Div., Samuel Moore & Co., Dept. RLC, Mantua, Ohio.*

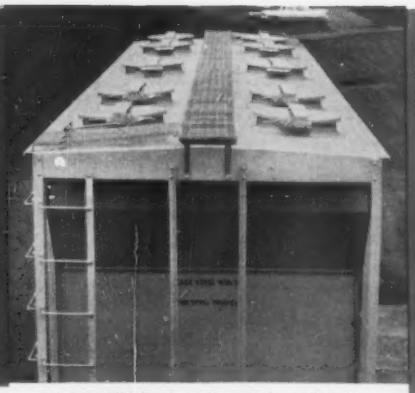
ANOTHER BENEFIT OF

P-S FULL LINE

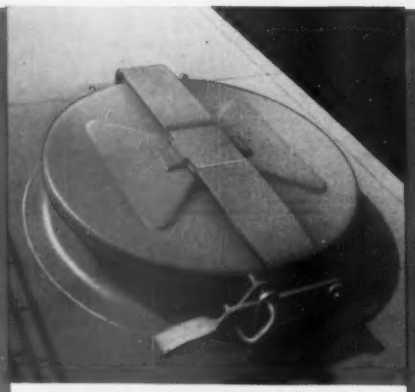
STANDARDIZATION

PS-2 COVERED HOPPER CAR

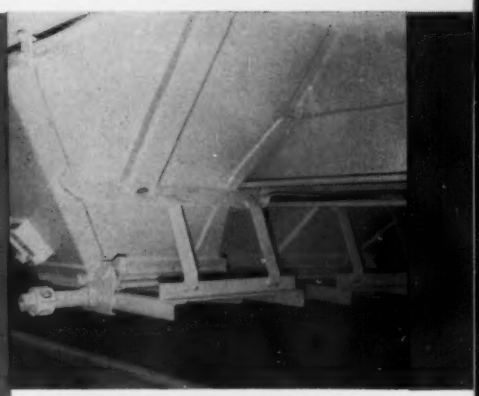
...The Ideal Way To Ship Bulk Lading



PS-2 ROOF—Smooth and almost flat, the PS-2 roof provides a safe, ample working area for loading crews. The use of circular roof hatches, the smooth, all-welded design and bulb angle side plates eliminate catch-all ledges, keep roof cleaner. Hatch covers open longitudinally.



PS-2 HATCH AND HATCH COVER—Contains simple lock and hinge pin arrangement with no loose parts. Upper lip of circular coaming is curved down to help exclude weather and dirt. The hatch cover fits tightly on the curved lip making a positive seal on the entire circumference.



PS-2 OUTLET GATE—Built for positive, easy action, the PS-2 Outlet Gate provides 11-inches of clearance between rail and bottom of gate. Hopper sheets are designed and sloped to facilitate unloading with chute openings placed to fit existing unloading accommodations.

The Standardized PS-2 Covered Hopper Car has been designed with both the railroad and the shipper in mind. Here's a freight car that will handle lading fast . . . thus cutting costly manhours. It will keep lading safe, clean, and dry . . . reducing damage claims for spoiled or lost bulk lading. And it is completely self cleaning . . . eliminating the need for car clean-out or hand unloading.

From rail to roof the PS-2 has been built to satisfy shipper demands for loading and unloading convenience while meeting railroad owner requirements for dependable service with minimum maintenance. Available in two or three hopper models, the PS-2 is offered in four capacities . . . 2007, 2929, 3215, or 3506 cubic feet. There's a choice of outlet gate arrangements available plus optional pneumatic unloading devices and special protective coatings for the car interior. In every aspect, the PS-2 is the ideal way to ship bulk lading ranging from sand or cement to grains or chemicals.

Whether you order in lots of 1 or 1,000 you receive all the benefits of P-S Standardization with your purchase of PS-2 Covered Hopper Cars. Already, 59 railroads and other users have put into service or have on order over 16,000 PS-2s to give their shippers the finest in dry, granular, bulk lading freight cars.

THIS BROCHURE IS YOURS ON REQUEST. Includes complete information on the PS-2 Covered Hopper Car—its features, details of construction, and general dimensions as well as complete specifications. Write today for your free copy. See how P-S Standardization makes the PS-2 your best investment in covered hopper cars.

PULLMAN-STANDARD

A DIVISION OF PULLMAN INCORPORATED

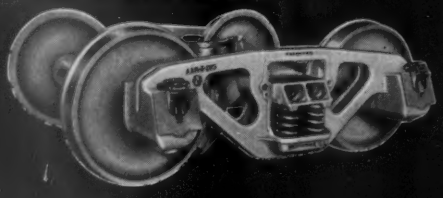
200 SOUTH MICHIGAN AVENUE, CHICAGO 4, ILLINOIS

BIRMINGHAM, PITTSBURGH, NEW YORK

J. C. Fennelly Company, San Francisco Representative

ECONOMICAL AND DEPENDABLE

for sure...



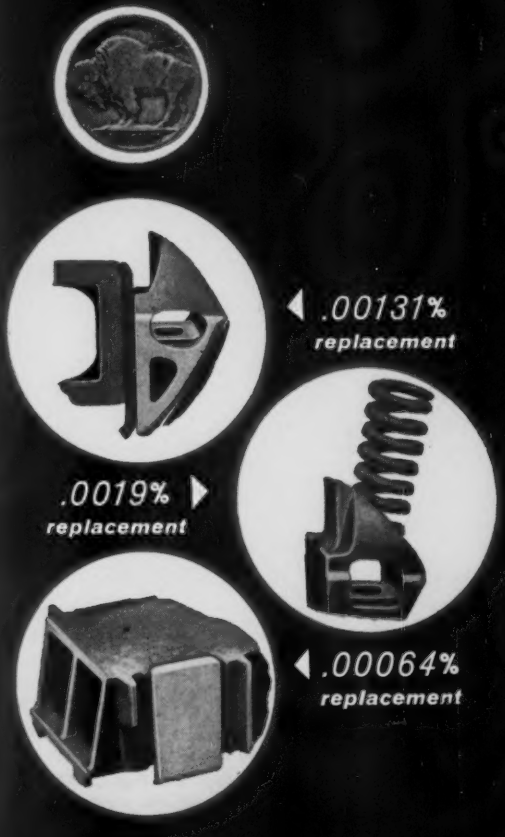
NATIONAL

COST LESS THAN 5¢ PER TRUCK FOR ALL PARTS REPLACEMENT IN 12 YEARS' SERVICE

Basic design of the National C-1 Truck has remained unchanged since its introduction over 12 years ago—because the C-1 design was right to begin with and needed no change. Strong claims? For sure. But here's proof of the soundness of C-1 Truck design.

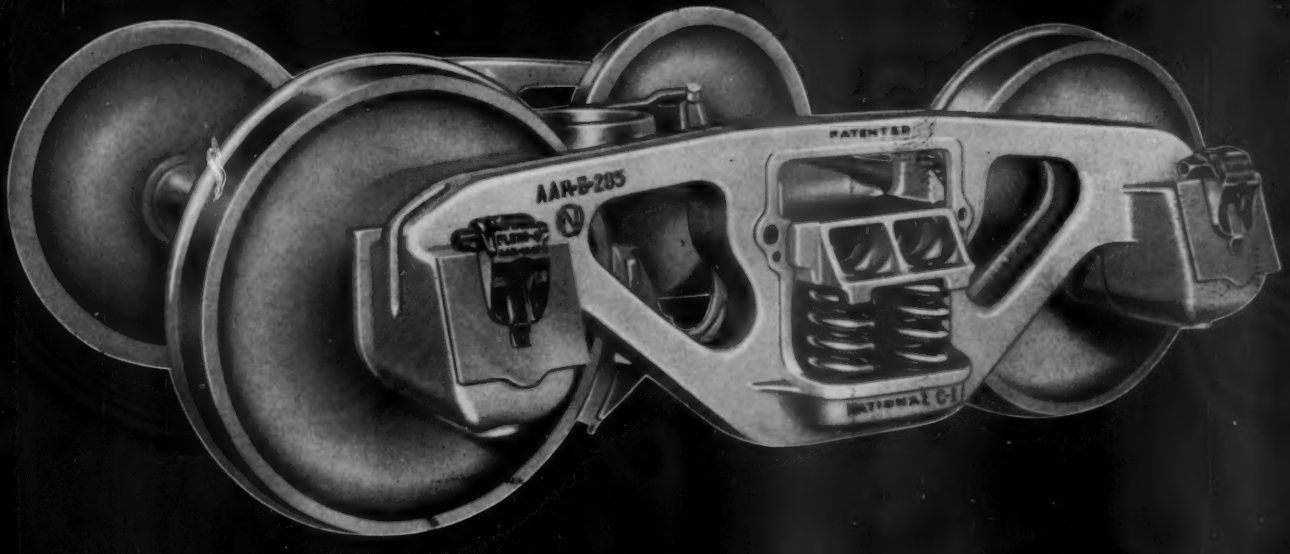
Service parts records show an average replacement rate of only .00129% for wedges, wedge springs and wear plates.

In spite of hundreds of thousands of miles of service, replacement parts costs averaged under 10¢ per carset—less than 5¢ per National C-1 Truck in service.



A-1907A

C-I TRUCKS



Transportation Products Division

International Division Headquarters
Cleveland 6, Ohio

CANADIAN SUBSIDIARY
National Malleable and Steel Castings Company of Canada, Ltd., Toronto 2B, Ontario

NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY

Cleveland 6, Ohio

COUPLERS • YOKES • DRAFT GEARS • FREIGHT TRUCKS • JOURNAL BOXES
NATIONAL SPEEDLOADER CONTAINER HANDLING SYSTEM

EDITORIALS

A September "Must"

The Coordinated Mechanical Associations' meetings at Chicago, September 12 to 14, are important. Of all the conventions, none rates higher with mechanical department maintenance personnel than the September convention. Over the years the meetings have proved to be outstanding forums where mechanical department men contribute up-to-date information and get straight-from-the-shoulder answers on maintenance work.

Are you interested in maintaining and servicing mechanical refrigerator cars? Is your road concerned about automation of air-brake testing procedures? What is the best method for you to use in upgrading a diesel engine to lengthen its economic service life? What kind of equipment does your shop need to rebuild engines efficiently? How can you do a better job in preventing freight loss and damage? Questions like these will be answered at the Chicago meetings.

The full scope of the September convention is presented on page 5. Committees of the Air Brake, Car Department Officers', Locomotive Maintenance Officers', and Railway Fuel and Operating Officers' Associations have done their usual competent planning in preparing information and data covering the mechanical departments' most pressing problems. Some of the best maintenance men in the United States and Canada have contributed to the reports.

The Coordinated convention has demonstrated its value in more than twenty years of service. To those who have attended these meetings over the years no "sales talk" is necessary to convince them that the convention is a September "must."

More Diesels

Railway electrification is the subject of the longest and most comprehensive report presented this year before the Electrical Section of the AAR. On the face of things, this seems odd since no one anticipates any new installation of electrification in the near future. The hard-pressed railroad man, working in an impoverished industry, must give all his attention to current problems, and futures more than twelve months away get scant attention.

There are, however, a sturdy few who keep the subject alive. They point to foreign developments and many new installations in which the tendency is to use electrification for main-line service and diesel power for branch lines and switching. The inferred question is: Why do not American railroads do likewise?

The easy answer is, "Well our conditions are different." True enough, but most of the differences will disappear when two basic needs are met. Electrification is best suited to heavy traffic. We have much of that, but it is divided among many railroads, a fact which limits the advantages which are offered. A federally operated railroad can better allocate the use of different kinds of motive power. Second, electrification requires large initial investment, something which few railroads in the States are able to make. A return of railroad prosperity, plus some mergers, plus increasing economic advantages, will initiate new installations of electrification. Unfortunately, no one is in a position to say when this will happen.

In the meantime, the railroads will need motive power —a lot of it. Rapidly accumulating data is causing operators and builders to conclude that the economic life of a diesel-electric locomotive is about 12½ years in road service and about 18 years in switching service.

Quoting the report: "Diesel locomotives were acquired in increasingly larger numbers each year between 1946 and 1951. In 1951, nearly 2,550 road units were acquired. More than 2,000 units were acquired in 1952 and in 1953.

"More than 20 per cent of all the units now in service were acquired before the end of 1948, and 60 per cent of those now in use were built between 1948 and 1954. There are nearly 20,000 diesel units in road service today."

Horsepower requirements are increasing. This need can be easily supplied by electrification, but with conditions as they stand in the United States, the demand for higher-powered locomotives will be supplied almost entirely by diesels. Much rebuilding and remanufacture and a rapidly growing market for new diesels is indicated.

Fourth-Dimensional Thinking

In an address before a joint session of the AAR Mechanical Division and Electrical Section in June, D. J. Russell, president, Southern Pacific, spoke about the fourth dimension in railroad thinking. Actually, this "fourth-dimensional" thinking is the kind that embraces the railroad industry as a whole.

Mr. Russell had a specific example that illustrated his point. The use of cheaper, or the so-called economy fuels, had increased SP locomotive maintenance costs by $600,000. At the same time, the cheaper fuels saved the Southern Pacific $2,600,000, so the net savings to the railroads was two million dollars.

This is an example of the thinking that Mr. Russell referred to as embracing the broader knowledge of the objectives and problems of traffic, transportation, and engineering personnel." This "fourth-dimensional" thinking is the kind of thinking that ignores departmental considerations.

We believe that the mechanical department has seldom been guided by narrow departmental objectives. We are sure that most mechanical department thinking has been directed toward the over-all forward progress of the railroad industry. At the same time, it is very appropriate that we be reminded again that we should always use this "fourth-dimensional" thinking in making decisions.

New Mainline Motive Power

FROM GENERAL ELECTRIC

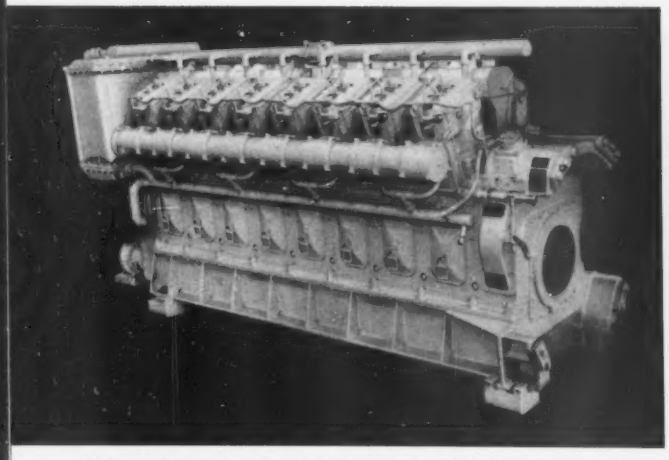
The General Electric U25B twenty-five hundred horsepower diesel-electric mainline locomotive — new from the rails up, with more power, less machinery — 65,000 pounds, 625-hp per axle — rugged simplicity over every inch of its length — a new standard of mainline motive power to provide faster, more reliable service at minimum cost.

For U25B Features that Make Possible New Levels of Mainline Performance, Turn to the Following Pages

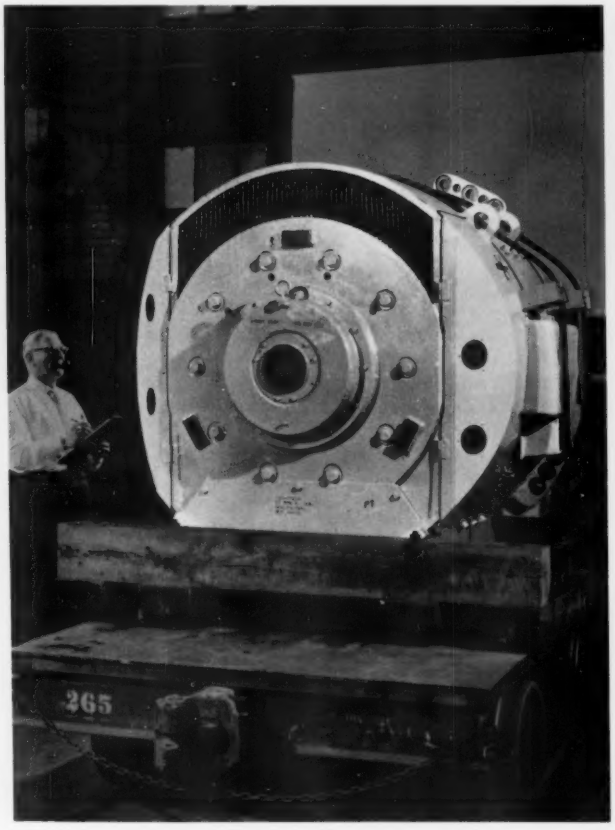
NEW GENERAL ELECTRIC U25B MAINLINE LOCOMOTIVE

first all-new diesel-electric locomotive in 15 years

. . . a carefully integrated design to meet the requirements of a new era of fast freight railroading, greater railroad competitiveness and profitability. *More power* — 50% greater than average mainline diesel-electric locomotives — enables the U25B to move freight faster. *Rugged simplicity* — 60% fewer electrical components, simplified mechanical design — establishes new standards of locomotive reliability and reduced maintenance. *Clean air* — through self-cleaning mechanical filters — reduces both cleaning costs and mechanical wear. The power, simplicity and cleanliness of the U25B offer significant savings in operating costs. With new G-E U25B locomotives, you can plan for maximum return on your equipment investment.



***MORE POWER IN THE DIESEL ENGINE** — twenty-five hundred horsepower — gives the new General Electric U25B diesel-electric locomotive 50% greater power than average diesel-electric units now in mainline service. And, the U25B has ample capacity to meet the challenges of tomorrow's faster traffic schedules, or to maintain your present schedules with fewer units.*

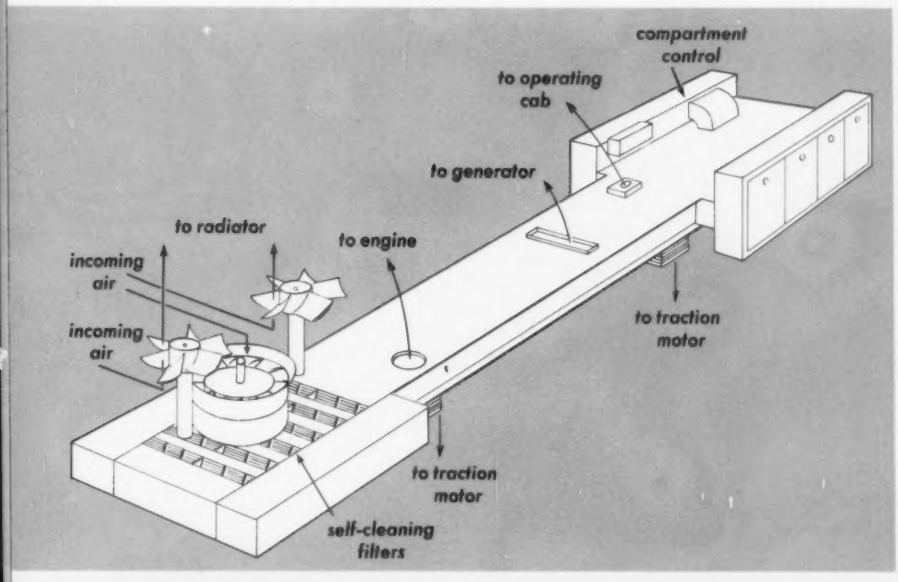


***NEW MAIN GENERATOR HAS AMPLE CAPACITY,** meets peak load requirements with generous safety margin, is specifically designed for the high-powered General Electric U25B locomotive. New insulation system gives maximum protection against heat and moisture, adds another element of reliability to this General Electric locomotive.*

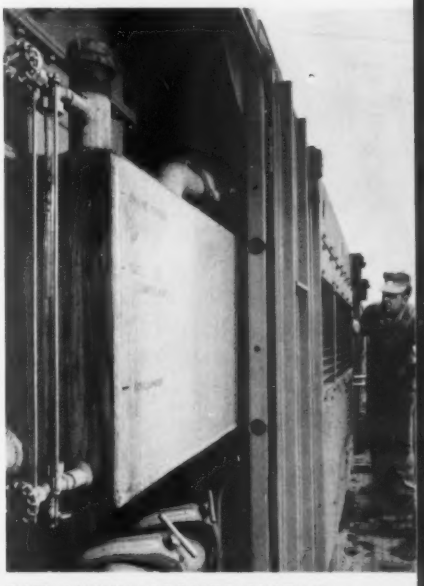
HIGHER ROAD SPEEDS
FASTER SCHEDULES

GREATER RELIABILITY
FEWER ROAD DELAYS

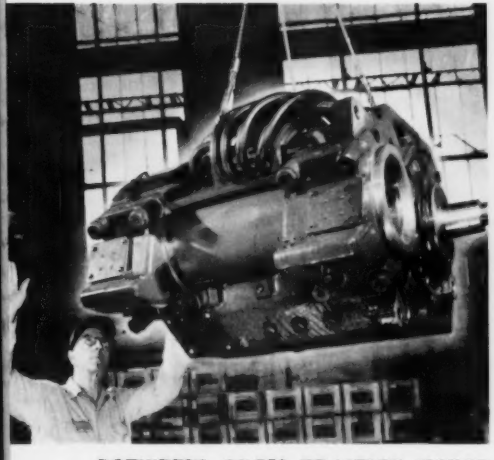
LOWER OPERATING COSTS
GREATER PROFITS



***NEW FILTERED AIR SYSTEM** on the U25B — a major advance in locomotive design — assures longer apparatus life, greater reliability, lower cleaning costs. All air (except for radiators and dynamic brake) is supplied by one blower through self-cleaning mechanical filters.*



***NEW ENGINE COOLING SYSTEM** on the G-E U25B locomotive eliminates all electrical devices and radiator shutters.*



***POWERFUL GE-752 TRACTION MOTOR** —proved by millions of miles on high-powered diesel-electric, gas-turbine-electric and straight electric locomotives — assures rugged dependability, capability of continuous ratings exceeding 700 horsepower—another G-E added value.*

***NEW ADHESION LOSS DETECTOR** — fast responding, the most effective automatic slip detection and correction method available — detects slips and slides at all speeds, corrects slip by a light application of independent air brakes before damage occurs.*

***NEW PRESSURIZED CONTROL** compartment houses rugged, heavy duty components — seals out dirt and moisture, virtually eliminates routine maintenance. Compartment on the new U25B locomotive invites white glove inspection.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

1895 *First Mainline Electric Locomotive*

1924 *First Diesel-Electric Locomotive*

1956 *Universal Diesel-Electric Export Locomotive*

1957 *Rectifier-type Freight Locomotive*

1958 *8500-hp Gas-Turbine-Electric Locomotive*

1960 · A NEW STANDARD OF MOTIVE POWER

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THE GENERAL ELECTRIC U25B IS THAT LOCOMOTIVE

For further information about the new U25B, contact your General Electric Apparatus Sales Office or Locomotive and Car Equipment Department, General Electric Company, 2901 East Lake Road, Erie, Pennsylvania. 105-01

Progress Is Our Most Important Product

GENERAL ELECTRIC

High-capacity refrigerators being added to PFE fleet are RPL cars designed to handle merchandise on westbound trips instead of moving empty.

PFE Mechanical Reefer Fleet Grows

1,000 cars in latest building program are designed to handle westbound movements of merchandise

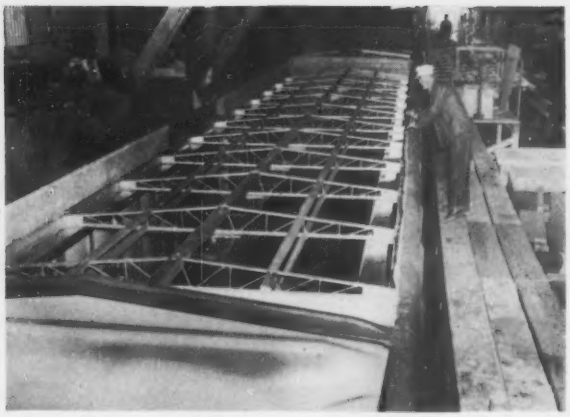
At a five-per-day rate, new 50-ft all-purpose mechanical refrigerator cars are joining the Pacific Fruit Express fleet. For several months, the PFE Los Angeles shop has been turning out these 50-ft cars. When deliveries are completed, the 1,000 Class R-70-12 cars will bring the PFE mechanical reefer ownership to 2,700 units—largest fleet in the U. S.

The cars are going directly into revenue service where they handle frozen foods, heavy "incentive" shipments of fresh fruits and vegetables, and large loads of canned goods, wine and nursery stock. To minimize empty mileage, the cars have been designed to handle westbound movements of merchandise and clean freight. Cost of the 1,000 cars is $26,000,000.

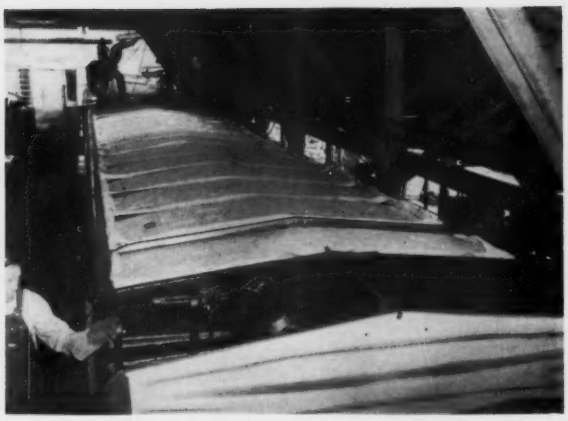
Lading temperatures can be maintained at any setting between minus 10 and plus 70 deg F. Cars are equipped either with Witte 100 RDS Model E or Detroit Diesel Series 2-53 diesel engines. Both engines have governors which allow operation in two speed ranges—the higher producing 60-cycle, 220-volt current from the alternator, and the lower speed yielding 40-cycle, 150-volt a-c.

During initial pull-down when a car has just been loaded, or when interior temperatures have risen, the engine operates at its high speed until the lading space temperature comes within 2 deg of the thermostat setting. Speeds which produce this 60-cycle, 220-volt current are 1,800 rpm for the Witte engine and 1,200 rpm for the Detroit engine. The thermostat will then operate to drop the engine speed to the low range, which conserves fuel and helps to control humidity. The low speeds are 1,200 rpm for the Witte and 800 rpm for the Detroit. It is expected that the engines will operate at their low speeds more than 80 per cent of the time.

As car temperature continues to drop, two of the three cylinders in the

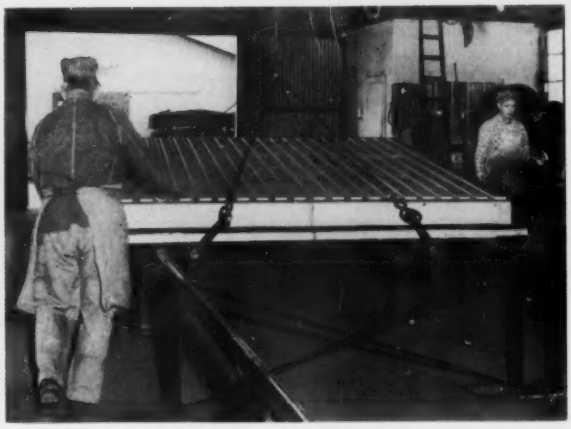


Ceiling assembly is applied after side insulation and wood framing are complete. Ceiling insulation and roof are then put in place.



Fiberglas and polystyrene insulation are used extensively. With roof insulation complete, carlines and roof sheets will be installed.

With blower and evaporator installed and tracks for load dividers in place on the ceiling, interior of car is ready for completion.



Use of plastic door liners and foamed insulation has reduced the weight of the wide plug doors with which the cars are equipped.

Trane compressor unload, reducing refrigeration capacity still further to control humidity. At 1 deg below the thermostat setting the refrigeration system cycles out entirely. Refrigeration equipment includes a 10-hp compressor motor, a 1.5-hp condenser fan motor, and a ¾-hp evaporator fan motor. Temperatures are controlled by a Partlow mechanical thermostat operating on a mercury bulb temperature-sensing principle.

When the thermostat is set at 20 deg or above, electric heating is initiated when lading space temperature goes 2 deg below the thermostat setting. Defrost is activated by an air pressure differential switch which operates when the evaporator has an ice build-up which restricts air flow. Heating current is 40 cycle, 150 volt with the engine in its low speed range.

When frozen foods are moved, the heating cycle and compressor unloading cycle are locked out of the system. Each car is fitted with a 500-gal fuel tank. Engines are started by 12-volt nickel-cadmium batteries which are charged by a rectifier taking its power from the alternator.

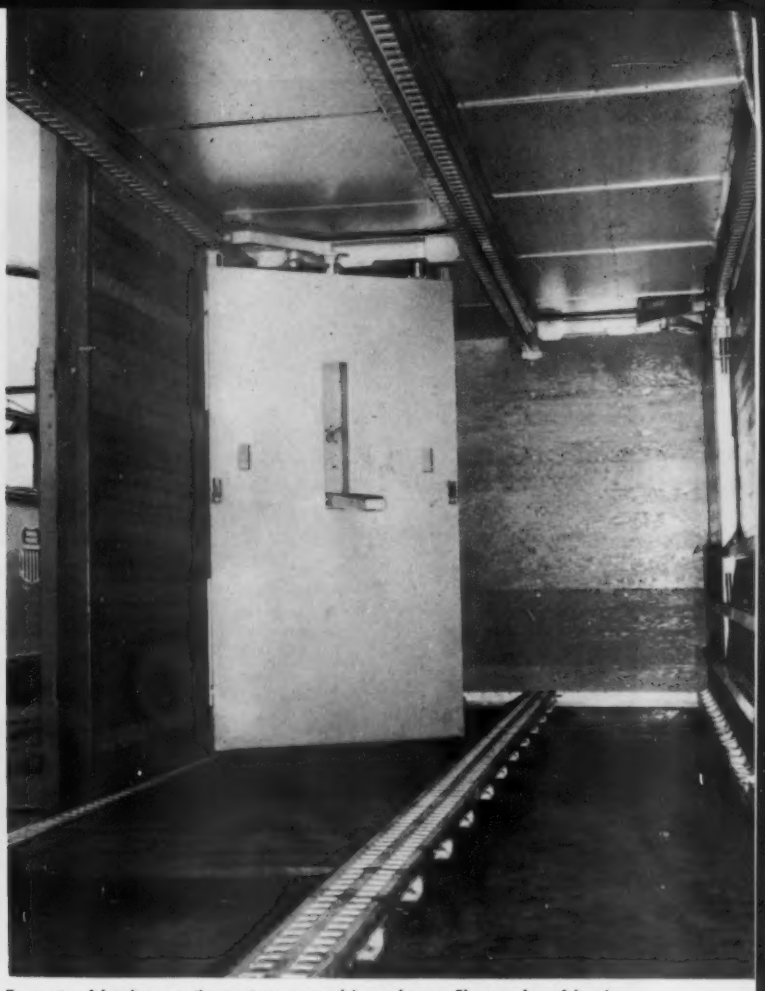
The completed car weighs 86,300 lb and has a load limit of 123,700 lb. All cars have 6- x 11-in. package-type roller bearings and trucks with integral snubbing arrangements. The welded underframes are built up with cast-steel end units which incorporate the draft sills and bolsters. The prefabricated sides have the side posts on the outside to make possible a simplified uniform application of insulation. This departure from conventional construction will reduce heat transmission into the lading space.

Walls are insulated with 7 in. of Fiberglas; roofs have 10 in. of panel-type and Fiberglas insulation, and floors are insulated on the assembly line with 7 in. of foamed-in-place polystyrene. A prefabricated ceiling assembly, installed after the side and end wall insulation and framing are complete, supports the upper tracks of the load dividers and forms the overhead duct through which air is delivered from the evaporator. The car has semi-envelope air distribution with circulation of refrigerated air down through wall ducts around the lading, plus a controlled volume which passes from

Principal Dimensions of PFE Refrigerator Cars

Length over pulling face of coupler, ft-in.	55-11
Length over end sills, ft-in.	52-2¼
Width over sheathing, ft-in.	10-1⅛
Width over side posts, ft-in.	10-4⅞
Extreme width, ft-in.	10-8
Height top of rail to top of running board, ft-in.	15-1
Height rail to top of floor racks, ft-in.	4-6½
Inside length between load divider gates, ft-in.	44-10
Inside width, ft-in.	8-8
Inside height, floor rack to ceiling, ft-in.	8-6½
Available clear loading height, ft-in.	8-2
Width of side door opening, ft-in.	8-0
Height of side door opening, ft-in.	8-2
Truck wheel base, ft-in.	5-8
Total wheel base, ft-in.	46-11
Light weight of car, lb.	86,300
Load limit, lb.	122,700
Load capacity, cu ft.	3,174
Fuel tank capacity, gal.	500

A tramrail-mounted crane is used to handle the diesel-driven alternators and refrigeration units awaiting installation.



Two sets of load separating gates are used in each car. Floor racks, of herringbone design, are mounted on aluminum floor stringers.

ceiling vents directly down through the load.

Each car is fitted with three ends. The bulkhead between the machinery compartment and lading space and the exterior end next to the lading space (B end of car) have the full structural characteristics required of freight-car ends. The outer wall of the machinery compartment (A end) is much lighter because it serves only to enclose the diesel engine and refrigeration equipment.

The lading compartment has aluminum I-beam floor rack stringers with hardwood floor slats of herringbone design which can support lift trucks during loading and unloading. The lading space can be divided into three compartments by the two steel load-dividing gates with which all cars are equipped. Gates can be locked at 2-in. intervals through the entire length of the lading space. Gate locks are positive devices designed to retain lading under practically all impact conditions.

To complete the roof, each carline is individually welded in place on the top rails. After the insulation is completed, roof sheets are welded to the carlines and the car sides. Actually, underframe, sides, ends and roofs are welded to form a single-unit carbody. Only rivets used in construction are for application of steps, handholds, hangers, and similar appurtenances.

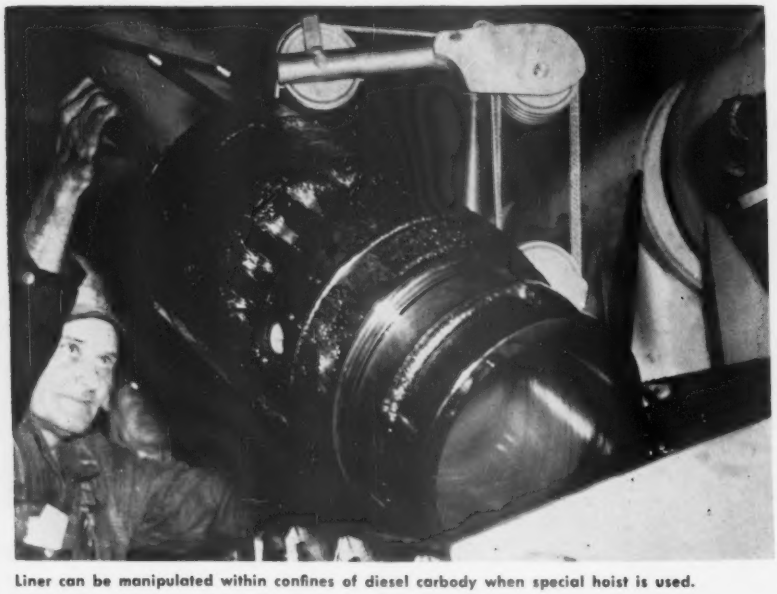
The plug-type side doors, 8 ft wide and 8 ft 2 in. high, have steel exteriors, plastic inner liners, and foamed-in-place insulation. Plastic liner, door gasket and foamed insulation are supplied as a unit. This door construction is said to reduce both weight and heat infiltration.

Partial List of Equipment on PFE Mechanical Refrigerator Cars

Trucks	American Steel Foundries Buckeye Steel Castings Co. National Malleable & Steel Castings Co. Standard Car Truck Co.
Roller bearings	Timken Roller Bearing Co.
Underframes	Gunderson Bros. Engineering Corp.
Underframes—cast-steel ends	General Steel Castings Corp.
Side doors	Superior Car Door Co. Youngstown Steel Door Co.
Door liner and gasket	Landis Industrial Co.
Car sides	Youngstown Steel Door Co.
Car ends	Standard Railway Equipment Mfg. Co.
Load dividers	Evans Products Co. Preco, Inc. Pullman-Standard Union Asbestos & Rubber Co.
Insulation	Gustin-Bacon Mfg. Co. Isoflex Corp. Landis Industrial Co. Owens-Corning Fiberglas Corp. Pittsburgh Plate Glass Co.
Batteries	Gould Batteries, Inc. Sonotone Corp.
Diesel engines	Detroit Engine Div., GM Witte Engine Works
Refrigeration units	Trane Co.
Thermostat	Partlow Corp.

An 8-to-1 pulley ratio gives 9 in. of lift to this head with 1-in. vertical movement of the hydraulic assembly.

Hoist Simplifies Cylinder Removal



Liner can be manipulated within confines of diesel carbody when special hoist is used.

A hoist, hydraulically operated, speeds replacement of EMD diesel cylinder liners and heads at Burnham shop of the Denver & Rio Grande Western in Denver, Col. Work can be done within the limited space of a diesel carbody. The hoist bolts to crab studs. The inverted L-shaped plunger assembly forms the horizontal boom and has a pulley at its end over which the cable and hook pass. Four pulleys on the cylinder and plunger give an 8-to-1 pulley ratio.

Short handle of hydraulic pump simplifies handling. It is extended with a length of pipe for operation. Handle can be reversed to extend to engineroom aisles whether hoist is used over cylinder to right or left of mounting bracket. Opening a needle valve releases hydraulic pressure to lower a head or liner as the plunger settles into the hydraulic cylinder.

N&W Tests Flat-Back Bearings

Tests show that a flat-back journal bearing overcomes short comings of the standard AAR steeple-back bearing. Over two years of testing conducted on one hundred 70-ton hopper cars by the Norfolk & Western have led to these conclusions. The N&W has recently been applying flat-back bearings to 1,200 more 70-ton hoppers under construction at its Roanoke, Va., and Princeton W. Va., shops.

In 1957, N&W mechanical officers, concerned with improving freight-car journal-bearing performance, decided that only limited improvement could be achieved with the standard journal bearing. Instead of resorting to costly installations of journal stops or other solid bearing designs, it was decided to look at possible modifications of the AAR steeple-back bearing.

Generally recognized deficiencies of the standard AAR bearing assembly have included the following:

- Horizontal displacement can occur during impacts.
- Limited arc of contact allows lubricating devices to be displaced along the rising side of the journal.

In discussing the problem at the American Brake Shoe Laboratory, N&W men became interested in a flat-back bearing evolved from designs developed in 1926 for inter-urban cars. Modifications have been used successfully on head-end cars since 1937.

The flat-back freight bearing design overcomes limitations indicated above. It also restricts lateral so the axle dust-guard seat will not run out of the dust guard. Modifications included in flat-back journal bearings are as follows: Mating surfaces of the wedge and bearing are made flat over the entire width to minimize vertical separation and prevent tilting of the bearing; width of the flat-back bearing is increased ¼ in. to reduce clearance between the bearing and journal-box column faces, reducing the effect of accelerating and decelerating impact forces and stabilizing the journal; vertical sides of the flat-back bearing have been extended ¼ to ⅝ in. according to journal-bearing size. Each side extension is the maximum which can be installed in the journal box through the standard lid opening. This provides more than twice the area of impact-absorbing surface contacting the column faces. Increased height of the extension of the sides of the bearing increases the collar and fillet thrust surface areas from 2½ to 5 per cent.

Resists Impact

Along with stabilizing and restricting journal movement, the flat-back bearing increases resistance to impact and wear both at collar and fillet ends. Weighing 47 lb in the 6 x 11 size (as compared to 35 for the standard 6 x 11), the extra weight is reflected in a more rugged bearing all around, and saving should accrue from increased service life based on tests to date.

Journal lubricating devices leave space in the bottom of the box for free oil, making a more serious problem of oil loss through the dust-guard opening. The flat-back bearing centers and restricts axle movement in the box, so the sides of the dust guard are not subjected to the crushing by the displaced axle. This stability also prevents spread linings and reduces the possibility of having strands of lubricating materials trapped between journal and bearing.

The N&W initially tested twelve of these bearings on an auxiliary tender which operated over 100,000 miles under close observation. Results were so promising that 100 new 70-ton hopper cars were equipped with flat-back bearings in February and March 1958. The cars were also equipped with dust guards, lubricating pads, and several types of lid seals.

After 19 months' service, an inspection report by the N&W stated, "It is evident that journal stops or flat-back bearings will restrict the movement of the journal within the journal box, such as occurs during braking or slack run-in and run-out. This results in a longer bearing life as well as a longer service life of the journal-box rear seals and, consequently, elimination

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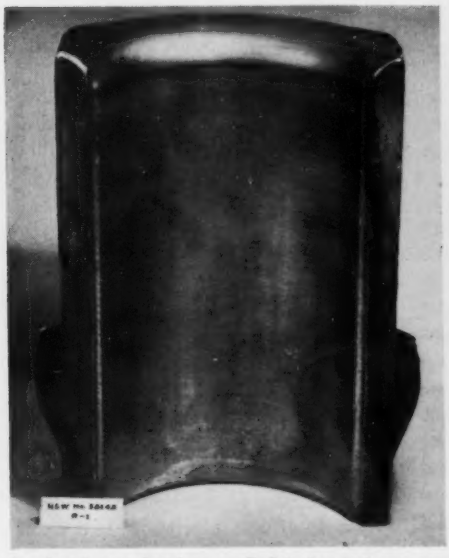
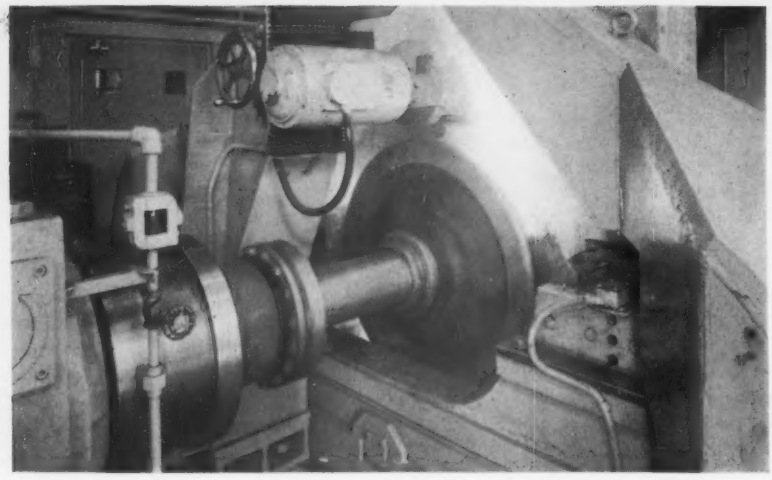


Lug location on bearings applied to two test cars produced straight wear pattern after running 9,500 miles.

Collar end of same bearing shown at left indicated that portion of babbitt flashing still remained after the car had operated from July 1959 to February 1960.



Emergency braking condition is simulated on wheel in inertia dynamometer at U.S. Steel Research Center. Stops result in thermal cracks which are discussed in this installment.

What Causes Wheel Tread Defects?

Part 2: Thermal Cracking

Shelling and thermal cracking of railroad wheels shorten wheel life, and checking brought on by severe braking may occasionally result in a complete wheel failure. Because most wheels serve as brake drums while also carrying the car, the analysis and reproduction of failures is complex. United States Steel undertook an investigation of wheel-tread defects at its Research Center at Monroeville, Pa.

Shelling was shown to be the result of repeated stress application to the rolling wheel, which apparently caused the tread metal to fail in shear. Cracks propagate from below to the tread surface. When two of these cracks of opposed orientation meet beneath the tread, metal between them is loosened and finally expelled. This is the typical shelling type of failure.

While shelling apparently is not caused by braking, there are wheel defects which can be caused by stresses that develop in the wheel rim as a result of thermal gradients generated by friction between the tread and brake shoe during braking.

Temperature gradients depend upon the amount of energy dissipated and the rate at which it is dissipated during each brake application. These thermal gradients can cause both microstructural and residual-stress changes in the tread of the wheel.

Defects caused by stresses developed as a result of braking are classified as thermal checks, sudden-type thermal cracks, and fatigue-type thermal cracks. Potentially, the sudden-type and fatigue-type thermal cracks are the most dangerous, because prolonged drag braking can cause explosive-type wheel failures to be initiated from either defect.

When cast-iron brake shoes are forced against the tread of a wheel during braking at normal operating speeds and pressures, the instantaneous contact area between the shoe and the wheel usually does not exceed 50 percent of the area of the shoe face; brake-shoe contact with the tread is made only at so-called "high spots" that may be as little as several thousandths of an inch higher than adjacent areas on the tread, or on the brake shoes. These high spots are generally believed to form as the result of uneven heating of the rim during braking. During a single braking operation, high spots may wear away and new ones form; thus it is reasonable to assume that the area of shoe contact on the tread continually changes. Since the high spots are the only areas at which high temperatures are generated during braking (temperatures up to 2,000 F have been measured at the tread surface of a wheel during a braking test), it is at such areas that metal from the brake shoe may fuse to the tread surface of the wheel.

Because the temperatures developed during braking are sufficiently high to cause microstructual changes in the metal near the tread surface, an indication of the severity of braking conditions to which a wheel has been subjected can be made by a study of the microstructual changes that have taken place. Microstructures typical of those observed adjacent to the tread surface of wheels subjected to severe braking from high speed are similar to those produced in steel weldments. Brake-shoe-metal deposit is bonded to the original tread surface of the wheel. The layer of metal immediately below the tread surface has a microstructure which indicates that carbon has diffused into the wheel tread from the higher-carbon metal of the brake shoe. Chemical analyses have shown that carbon diffusion may penetrate as deep as 0.02 in. into the tread of a wheel subjected to a single brake application from high speed.

Residual-Stress Changes

In addition to microstructural changes, residual-stress changes also occur in the rim of a wheel as the result of thermal gradients generated by friction during braking. Consider the rim of a wheel as a series of concentric layers that are bound tightly together. If the outermost layer is heated to a relatively high temperature in comparison with an adjacent colder layer, the

Second of two installments based on paper prepared by J. M. Wandrisco and F. J. Dewez, Jr., Applied Research Laboratory, United States Steel Corp., for presentation before the recent ASME-AIEE Railroad Conference at Pittsburgh, Pa.

Single emergency stop from 115 mph built up brake-shoe metal and developed sudden-type crack (left). Fracture surface of this thermal crack went far below surface (above). Wheel involved is CR type with high carbon.

ability of the higher temperature layer to expand into a larger diameter ring is restrained by the colder layer beneath it. Because the outer layer of metal cannot expand, compressive stresses will be developed that will cause it to be deformed, first elastically, then plastically, in a circumferential direction.

On cooling, the metal that has plastically deformed in compression will revert to a state of tensile stress, thus setting up hoop tensile stresses. The amount of plastic deformation and the resultant tensile stress is primarily a function of the thermal gradient developed during braking. There are other factors that are believed to affect the magnitude of the stresses developed in wheel treads, including the elevated-temperature strength of the wheel steel and volumetric changes associated with microstructural transformation changes.

Rim Defects

The study of new and of used wheels indicated that there are at least three types of tread defects caused by thermal stresses. Thermal checking is believed to result from tensile stresses that occur within the area of metal that has been heated above the upper transformation temperature of the steel. This type of cracking—commonly known as "crazing"—can be observed on almost any railroad wheel on which tread-type brake shoes have been used. Observations indicate that stresses which cause thermal checking may be associated with diffusion of carbon from the brake-shoe-metal deposits and the tempering of martensite.

Thermal checks observed on the tread surfaces of most wheels are believed to be caused chiefly by tensile stresses developed within the carbon-diffusion layer. Thus, tensile stresses can be developed in a high-carbon region (produced by diffusion of carbon from the brake-shoe metal), because it has a smaller volume after transformation to either pearlite or martensite than the surrounding lower-carbon regions.

Observations indicate that thermal checks do not progress beyond the hypercritically heated area, but that they are continually worn away in service and are replaced by new, similar checks. Thermal checks are, therefore, not believed to be dangerous, except that they may act as nuclei for other types of cracking.

Sudden-Type Cracks

The appearance of the fracture surfaces of sudden-type thermal cracks is typical of brittle failure. Because the cracks are relatively large when first formed and propagate rapidly, they are considered the most hazardous tread defect. Thermal cracks at the front of the tread or in the flange of a wheel are known to act as stress raisers to initiate an explosive failure.

These cracks may be nucleated by thermal checks, but their cause is indicated to be entirely different. Evidence indicates that they occur as the result of the tensile stresses induced by the thermal expansion of the rim during braking.

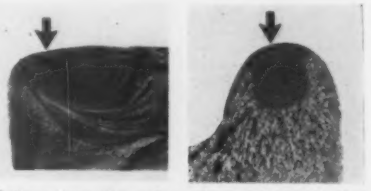
Results of full-scale braking tests performed at the University of Illinois in cooperation with the Technical Board of the Wrought-Steel Wheel Industry indicate that higher-carbon steel railroad wheels are more susceptible to thermal cracking than lower-carbon steel wheels. This work was used by the Association of American Railroads as the basis upon which the present composition specifications for Class A, Class B, and Class C wheel steels were developed.

Results of studies conducted with the United States Steel wheel-testing dynamometer have confirmed that higher-carbon steel wheels are more susceptible to sudden-type thermal cracking than lower-carbon steel wheels. The mechanical properties and the residual stresses of rim-toughened wheels of various compositions were studied. All the wheels produced for present heavy-duty service are heat treated to obtain maximum hardness for wear resistance. They contain some residual stresses as the result of the heat treatments.

Residual tensile stresses are developed at the treads of wheels subjected to a single brake application from high speeds. Residual tensile stresses increase with increasing carbon content of the wheels.

It is believed that a sudden-type thermal crack forms when the residual tensile stresses that develop in the rim of a wheel as the result of braking exceed the brittle-fracture strength of

(Continued on page 62)



Fatigue-type thermal crack may be nucleated from front edge of tread (left) or from the tip of the flange (right). Failures usually occur on switcher locomotives or m-u cars.

Fatigue-type cracks developed on tread in actual service. Arrow indicates rim edge of tread surface. Fluorescent inspection used.


KEY PLAN
GENERAL ARRANGEMENT
BOARD C
LATITUDINAL SECTION
2 REQ'D PER CAR
END VIEW
BOARD BI
BOARD B
BOARD A
CENTER SECTION
1 REQ'D PER CAR
INTERMEDIATE SECTION
5 REQ'D PER CAR
END SECTION
2 REQ'D PER CAR
DETAIL C
DETAIL D & J
DETAIL G
DETAIL H
DETAIL E
DETAIL F
new design...

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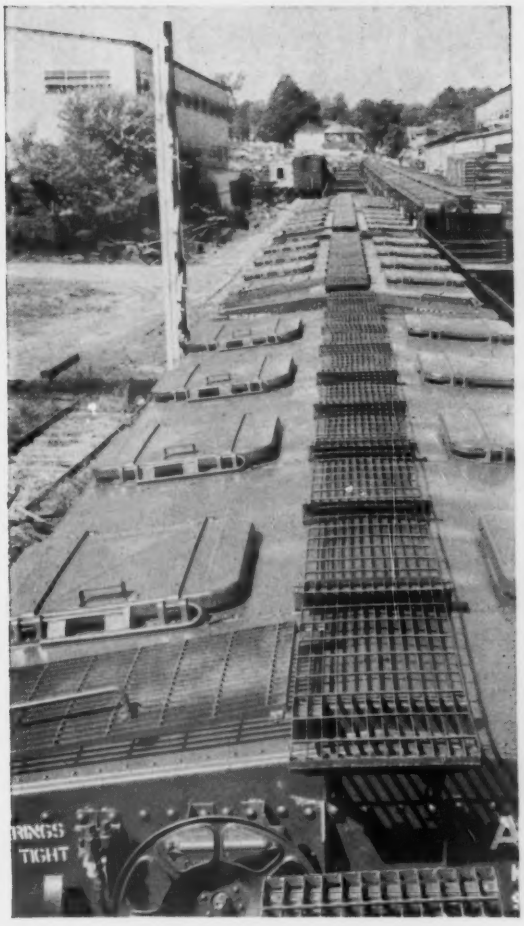

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Diesel Repair Time Savers

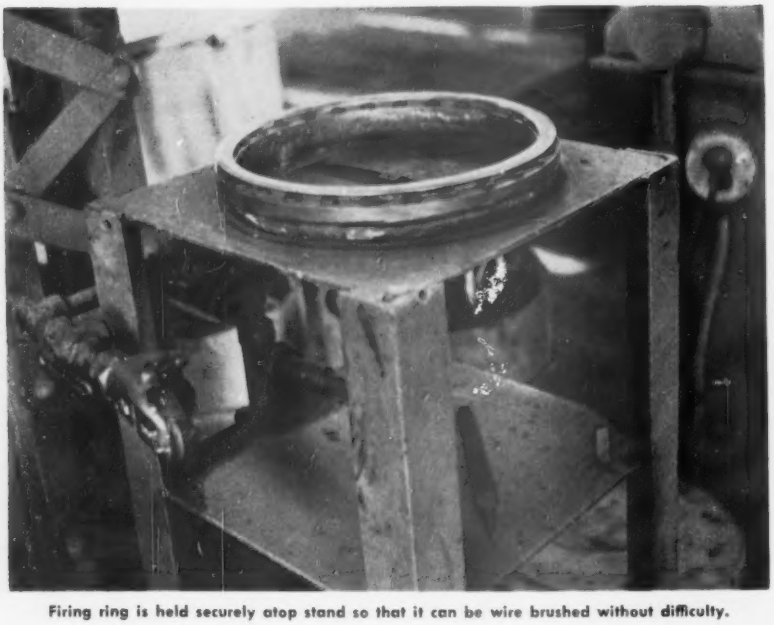
IC Air Filter Repairs

Repair of broken joints in air-filter frames is a one-man job at Illinois Central diesel shops. Two 4-in. lengths of 3- x 3-in. angle are welded to a 3- x 24-in. base plate. The two angles are 19¾ in. apart to hold one side of the filter. A third corner is held by a length of angle welded to a pin-hinged lever. The pressure of welder's body against lever squares filter so that necessary welding may be completed.

DT&I Compressor Test

Bed of a retired lathe forms the base plate for the mounting of diesel air compressors during break-in at the Flat Rock, Mich., shop of the Detroit, Toledo & Ironton. Compressors can be completely load tested following overhaul. They are powered by a 25-hp, 220-volt, 3-phase motor. Compressed air produced by machines undergoing the break-in feeds shop air lines when needed. Receiver pressure limit is 150 psi.

Soo Line Jig for Cleaning EMD Firing Rings



Firing ring is held securely atop stand so that it can be wire brushed without difficulty.

Device for simplifying the cleaning of head seat rings for EMD engines has been developed by the Soo Line. Vacuum holds the "firing ring" so that a wire brush can be used. The ring is turned after one side has been cleaned and the procedure is repeated on the other side. Device was developed and is installed at the Soo Shoreham shop in Minneapolis, Minn.

Stand which holds the vacuum ring is 32 in. high, a convenient working height. On the top of the stand a 12⅞-in. ring of ½-in. pipe is mounted. On top of this pipe is a steel ring which is ½ in. thick and ⅞ in. wide. Twenty-eight 1/16-in. holes are drilled through the ring into the pipe. A rubber grommet is mounted over each hole. Air at 100 psi is discharged through a pipe tee. This forms a venturi tube which produces the vacuum which retains the head seat ring during brushing.

Chemical Dries Locomotive Brake Air

A six months' test on an EMD freight unit has shown the Frisco that a chemical dryer is a satisfactory and practical device for removing moisture from compressed air. The dryer, according to Frisco officials, consistently removed enough water vapor from the brake air to prevent any possibility of water accumulating in brake equipment.

The Van-Air Model 400 dryer was also an effective filter, removing oil, gum and foreign matter before it could enter the brake valve. The drier is 50 in. high, has a diameter of 16 in. and weighs 227 lb empty (RL&C, May 1960, p. 10).

Dry-O-Lite, the drying agent (desiccant) used, is hygroscopic and dissolves by absorption of moisture from the air, slowly draining away with the polluted condensate. No heating or regeneration of this desiccant is required. Six locomotives so far equipped with the dryer indicate a maintenance cost of under $20 per unit per year.

A requirement of the revised Locomotive Inspection Act (RL&C, May 1958, p. 14) led to the Frisco's dryer applications. Rule 205 (f) reads: "Each air-brake system shall, by June 1, 1959, be provided with a device in the air-compressor discharge line which will effectively restrict passage of oil throughout the system. Such devices shall be kept clean and drained before each trip, or day's work." At that time, there were no proven devices which would comply with this law other than the system of manual drain valves. The AAR has subsequently clarified this requirement. The clarification issued last summer (RL&C, July 1959, p. 7) states: "Rule 205 (f): Prevention of Oil Passage. Draining of the main reservoir, either manually or automatically, and cleaning of the H filter, provided the air compressor is properly maintained, will meet the requirements of this rule."

Water found in diesel locomotive air systems results because the compressed air is not cooled to a low enough temperature by the radiation equipment. One method that could lower the air temperature would be an aftercooler cooled by refrigeration, an installation considered too expensive at the present time. A second method of drying air is by absorption. Excess water can be removed by passing the air through a chemical having an affinity for water. This is the principle of the Van-Air dryer.

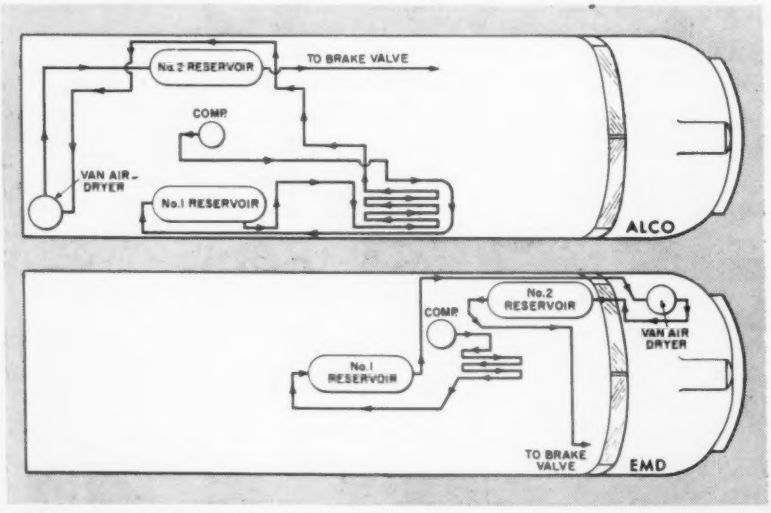
The test dryer was placed in the air line between the No. 1 and No. 2 air reservoirs on EMD unit 5004 in February 1958, the brake equipment previously being cleaned and reconditioned. Test instrumentation included a flow meter, thermocouples, air sampling cocks and corrosion test strips. Flow rates, temperatures moisture content and corrosiveness of air before and after passing through the air dryer were all measured.

The brake equipment, removed the following September for semi-annual inspection and cleaning, was in very good condition compared with similar equipment on other units. Valves and rings were free and functioned smoothly. The only deposit was a thin coat of varnish in the S40D independent brake valve. This was soft and did not restrict movements of parts. All other valves, seats, springs and parts were free from deposits.

Corresponding parts removed from other locomotives usually show heavy deposits that restrict moving parts and partially block ports. Lubrication of the sliding surfaces was unusually good. A thin film of oil was present, with no sign of corrosion or rust. In the opinion of Frisco inspectors, the brake valve could have operated another six months and still have been in better condition than brake equipment with only six months' service on units without the dryer. They feel that if this performance continues, it could be possible that there could be longer periods between inspections of brake equipment.

The Van Products Company recommends that air entering the dryer be at temperatures not more than 100 deg F. Drying efficiency drops with air warmer than 100 deg. During operation of locomotives in warm weather, air entering at times will be above 100 deg. The Frisco believes that this will not materially affect the dryer performance, which, under these conditions, still removes nearly all the excess moisture which could condense in the brake system.

The railroad reports the dryer is sturdy, simple to install, requires little maintenance, and is economical. After the initial charge of 200 lb of Dry-O-Lite, tests show that an additional 40 lb will be required annually. Four EMD and two Alco 1,500-hp units are now equipped. Dryers are in the nose compartment of the EMD's, and in the left rear portion of the engine room on the Alco's. The approximate installation cost is $800 per unit. The Frisco justifies this cost because they estimate that excess water in brake air costs as much as $400 annually per locomotive unit in damage to equipment and shipments, in train delays and in extra maintenance.



Applications of the Van air dryer system have been made both to Alco (upper) and Electro-Motive (lower) road freight units. Subsequent tests have shown equipment to be effective, Frisco reports. Van unit operates at pressures up to 200 psi.

ELECTRICAL SECTION

EMD Develops New Wheel-Slip Control

Sensitizing wheel-slip relays with generator voltage makes possible slip detection at high locomotive speeds

Part 1

A simplified wheel-slip control system retaining all the characteristics of the installations on GP locomotives and incorporating changes to improve operation at higher locomotive speeds has been adopted by GM's Electro-Motive Division.

The system is sensitive to slips at stalling or low-operating speeds. High sensitivity is maintained over all speed ranges. Motor over-speeding is recognized whether due to simultaneous slipping or locomotive operation at excessive speeds. The system also protects against malfunctions of the transmission system.

Initially, wheel-slip control was concerned primarily with train starting and low operating speeds. The trend toward multiple-unit locomotives in high-speed freight service has changed these requirements materially. Higher horsepower per axle and high average train speeds emphasized the necessity for detecting and correcting slips more rapidly over a wider operating range. Positive wheel-slip sensing and control devices are necessary to prevent damage to wheels and rails.

The system must also monitor the main power circuits to prevent damage to motors from overloads which can result from malfunctions in the power system or through mechanical difficulties in the drive components. To understand how the wheel-slip control system functions on GP locomotives, it is necessary to outline some fundamentals.

The relationship between the wheel of a locomotive at rest and the rail is essentially that of static friction; the relationship between the same wheels and rail at maximum permissible speed is almost beyond definition. Under this last condition, friction is certainly less than when stalling or at low speeds. Whether at stall or moving, the adhesion of a slipping wheel has a value lower than that of static or rolling friction. There is an adhesion zone between rolling and slipping that seems to be different each time it is observed. This zone is referred to as "wheel creep" and is the transition area from "rolling adhesion" to "slipping adhesion."

When a series motor drives wheels that are subject to slipping and the motor is connected to a constant voltage supply, the torque applied to the wheels will diminish as speed increases, and the current through the motor decreases. Usually the torque required to support slipping is less than the motor is capable of producing until extremely high speeds are reached. This is generally the situation when there is a parallel motor connection. In the series motor connection, when two (or more) motors are in series to the power supply and slipping occurs, the current decreases in the branch containing the slipping wheel, and the voltage rises across the motor driving the slipping wheel. These quantities (voltage and current) are used in the EMD wheel-slip detection and control system.

System Requirements

Requirements for the wheel-slip detection system are:

- Recognition of wheel creep;
- Recognition of wheel slip at stalling or low speeds, also at high speed;
- Detection of malfunctions in the transmission.

Basic wheel-slip control on GP-9 locomotives emphasizes the drag service requirements and consists of a wheel creep relay (WCR), a wheel-slip series relay (WSS) and wheel-slip relays (WS). The wheel-creep and wheel-slip-series relay operate in response to current only. The wheel-slip relays are operated either by a voltage coil or by a difference of current in motor-power branches. The wheel-slip relays operate only as voltage-sensitive devices to compare the voltage of motors connected in series and only as current-sensitive devices to compare the current levels of motors connected in parallel. The three classes of relays perform three different functions. Wheel-creep relays operate only the automatic sanding. Wheel-slip series relays reduce the generator excitation a small amount by dropping the battery field excitation only. Wheel-slip relays reduced the excitation drastically by dropping both the shunt and battery field contactors. To be selective about this corrective action, it was necessary that the WCR relays be the most sensitive, the WSS relays next in sensitivity, and the WS relays the least sensitive. At high speeds, when only WS relays operate, the system is least sensitive.

The wheel-creep relay and automatic sanding feature has been basic on GP-9 locomotives. Many users are apparently unaware of this and make no attempt to use it to their advantage. It was developed in cooperation with one railroad to eliminate air-brake, electrical and engine troubles; to reduce filter maintenance, and to cut the quantity of sand applied by the engineman. The so-called "creep zone" is at or near maximum continuous tractive effort. Operating results obtained with the WCR and automatic sanding are not measurably different from what would be obtained by continuous sanding. With less sanding, train resistance is reduced.

The need for more effective high-speed wheel-slip detection was first recognized in the operation of E type

This is the first of two articles on the wheel-slip control system developed for General Motors locomotives. The article has been prepared by the Electro-Motive Division.

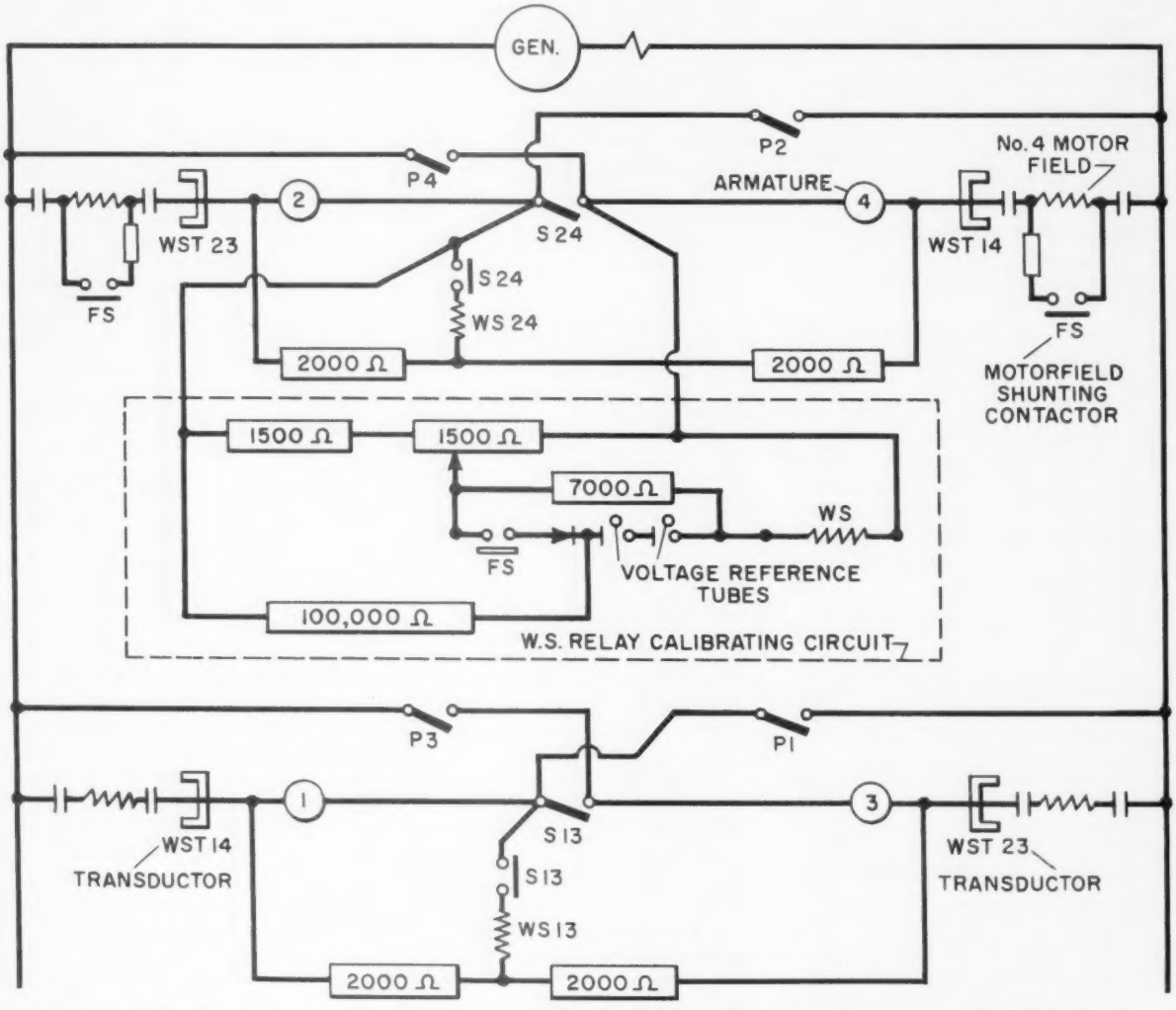
(passenger) locomotives because of the higher power delivered by each driving axle and the sustained operation at higher speeds. Tests proved that effective detection was obtained by sensitizing the wheel-slip relays with generator voltage.

Latest Application

This sensitizing principle has been used in late four-motor road locomotives, except that static components have now replaced the current-operated relays. This reduces the number of relays, permits use of more conventional relays, and simplifies adjustments. The wheel-slip relay, although conventional, has two active coils. AB responds to transductor output, and CD is a calibrating coil. Two transductors, WST14 and WST23, not previously used on EMD locomotives are in the new control system. These transductors produce a current proportional to the difference in current between two cables, which pass through the transductor cores carrying current in opposite directions.

Fig. 1 shows the essentials of the four-motor road locomotive transmission and is the basis for explanation of the wheel-slip detection arrangement. Examples of what happens when slipping occurs will describe the functions. At stalled conditions, assume a locomotive is straining to start a stubborn train and current is increasing in the motor power circuits. In this case, the S13 and S24 contactors are closed and there are two parallel motor circuits. The current flowing in each circuit is determined only by the resistance of the two motors. Since they are identical, the currents are equal in the two branches. If the No. 1 motor drives slipping wheels, the No. 1 armature generates a voltage which opposes the voltage impressed by the generator. This results in materially reduced current in motors 1 and 3, even if the No. 1 motor turns only at one per cent of rated speed. Here the motor functions as a potent amplifier to detect a difference in speed between the two motor armatures.

(To be continued)



AB — Main pick-up coil for WS Relay
CD — Sensitizing Coil for WS Relay
P1 — Parallel Power Contactor, Motor 1
P2 — Parallel Power Contactor, Motor 2
P3 — Parallel Power Contactor, Motor 3
P4 — Parallel Power Contactor, Motor 4
S13 — Series Power Contactor, Motors 1 and 3
S24 — Series Power Contactors, Motors 2 and 4
WCR — Wheel Creep Relay
WS — Wheel Slip Relay
WS13 — Wheel Slip Relay, Motors 1 and 3
WS24 — Wheel Slip Relay, Motors 2 and 4
WSS — Wheel Slip Series Relay
WST14 — Wheel Slip Transductor, Motors 1 and 4
WST23 — Wheel Slip Transductor, Motors 2 and 3

Fig. 1—Wheel-slip-control system applied to latest EMD locomotives has been sensitized so it will detect slips at relatively high locomotive speeds.

AAR Electrical Section Chairman Urges:

Use Latest Electrical Developments

New developments in solid state devices, in brushless alternators, electronics, and in computers should be watched closely by railroad electrical engineers, J. J. Schmidt, chairman of the AAR Electrical Section, told the Section's annual meeting in San Francisco in June. The Section should spend less time in reporting what has been done and concentrate on devices and techniques needed to prepare the railroads for the future, according to Mr. Schmidt who is electrical research engineer of the Denver & Rio Grande Western. "I find it inconceivable," he said, "that there is not one electrical or electronic research project under way in the AAR laboratories."

Mr. Schmidt said that the Electrical Section should take every opportunity to apply new electrical developments, not staying with the "tried and true" simply because it has always been done this way. Operations research is a technique which can be applied to maintenance and to specification and selection of components.

A new product, device or technique *is* needed when an appraisal indicates that there is nothing better for a particular job. Many control devices in the railroad field have their counterparts in the missile field and associated electronic industry. The railroads, Mr. Schmidt said, should take advantage of the millions spent on electronics developments. He concluded by saying that the Electrical Section should be in the midst of an investigation into the so-called "automated railroad."

P. B. Burley (left), Illinois Central superintendent communications and electrical engineer, succeeds J. J. Schmidt, D&RGW electrical research engineer, as Section chairman.

P. B. Burley, superintendent communications and electrical engineer, Illinois Central, was elected chairman for 1960-61 at the closing session. R. H. Russell, electrical engineer, Great Northern, is the new vice-chairman. New members of the Committee of Direction are A. L. Veith, assistant general superintendent motive power, Wabash, and R. J. Berti, electrical engineer, Union Pacific. Electrical Section membership increased from 862 in 1959 to 998 in 1960.

Diesel Techniques Refined

Several methods for efficient cleaning of mechanical parts of diesel locomotives have been outlined by the Committee on Electric and Diesel-Electric Locomotive Facilities and Procedures. These include hand cleaning, hot steam jet, pressure spray with solvents, agitating machines, high-pressure cleaning booths and abrasive blast cleaning machines. The report was presented by E. P. Bledsoe, Seaboard Air Line. Ultrasonic cleaning has proved to be very effective. H. R. Morgan, Milwaukee, pointed out that there was nothing in the report to cover cleaning of electric locomotives. A procedure for cleaning radiators and coolers in place is described. Two types of cleaners are used—acid for removing corrosion and alkali for removing oil deposits.

Concerning the merits of glass banding to replace the steel armature bands, the committee reported: "Properly designed and applied glass bands exhibit strength equal to that of a steel wire band." The Pennsylvania is reported to have about 6,000 armatures banded with glass tape.

John Kuscharsey, Pennsylvania, gave a comprehensive report of work done by his road with epoxy resins. Mr. Kuscharsey said that vacuum impregnation must be utilized to get resins down into the structures of field coils. Resins must then be dried into the structure with relatively high temperatures. Rewinding an armature with aged insulation which still tests OK electrically is very wasteful, it was pointed out. Cost for restoring an armature with vacuum pressure impregnation is $160 as compared to $1,400 for a rewinding job. A loose commutator with mica segments out ⅛ in. can be tightened with vacuum impregnation and give satisfactory service, Mr. Kuscharsey said.

The report states: "Experience to date demonstrates that rigid application techniques, including the use of coreactive materials, complete resin fill by vacuum impregnation, and controlled cure of resins under pressure insures an integrated insulation system which has proved its superiority over conventional insulations. However, it cannot be assumed that the system is foolproof. Failures will occur, but with less frequency."

Questionnaires concerning wear limits of traction motor support bearings, pinions and gears show the majority of roads follow manufacturers' recommendations. While all roads condemn gears and pinions on minimum thicknesses of tops of teeth, gear tooth profiles can wear excessively even though the top of the tooth has not reached its condemning limit. General Electric now offers a gear profile restoration gage to check tooth profile for its ring gears. As a general rule, gears and pinions having a deviation from profile of 0.008 in. or less can be used in any service, and from 0.008 to 0.015 in. in light service. Gears with less than 0.080 in. total wear (maximum deviation from profile plus wear) are candidates for salvage grinding.

Semiconductor Development

Recent developments in the use of silicon semiconductor components show considerable promise for application to locomotives and cars. Two suppliers have marketed

transistorized voltage regulators for use in battery charging circuits of rolling stock equipped with 64-volt batteries. The other principal use of the semiconductor at present is as a blocking diode in the battery charging circuits to eliminate the standard reverse current relay and battery charging contactor. A thorough study of the circuit characteristics should be made to protect the diode from damaging transients due to circuit interruptions. Small discharge diodes, when correctly placed electrically, are reported a satisfactory solution by the Committee on Automotive and Electric Rolling Stock.

The committee generally agreed that the use of permanently connected jumper cables is not feasible because of difficulty of replacement in case of failure, the practice of removal for quarterly testing, and the different lengths required between units. Securing of the unattached end is also a problem, including clearance between the unit and the first car in the train.

A thorough study was made of failure of component parts of traction motor brushholders on EMD freight locomotives. The pattern of failures was divided into three parts—failure of spindles, cotter keys and brush tension springs. Several causes of failure are cited and the report states: "It is possible, although it cannot be definitely substantiated, that changes in design of brushholder casting itself may contribute to the failure of the component parts. The holder casting has been changed several times, the present design being considerably lighter, making it more flexible than the original design. It is possible that the more flexible casting is permitting excessive vibration, resulting in failure of weaker members, or in some cases the casting has failed. This along with use of polyester insulated studs, which, due to their hardness compared to the brass tube porcelain type, seem to possess the ability to transfer shock and vibration rather than being absorbed in the stud." The study concludes that the most encouraging solution seems to be that improvement to the present brushholder using the design spring currently being field tested will be the answer to the problem.

The report was presented by H. C. Taylor, Southern. Wheel slip problems were discussed with explanations of the two types of detection systems now in use. The first utilizes the unbalances of currents in the motor circuits during wheel slipping or creeping, the resultant magnetic field established actuating relays. This method also detects slip or creep in dynamic braking. The second type, which is axle mounted, compares axle speeds. However, it does not recognize slipped pinions or broken armature shafts. Mr. Taylor advised that the Southern had tested two of the GE locomotives, m-u control, with Brown Boveri anti-wheel slip brake on one side, and sand on the other. The system was considered very effective—some 150 to 200 miles were run without using sand.

The committee reports studies are being made to overcome the problem of wheel slip on locomotives equipped with 62:15 gear ratio in high-speed freight train operation. Regrouping of motors and maintenance of comparable wheel sizes is considered helpful, as also is the conversion from field loop control to potentiometer or micro-positioner control of the dynamic brake. Full dynamic braking power is developed on each unit regardless of the number of units in a consist. Mr. Taylor said the Southern is changing EMD "F" units over from field loop control to potentiometer control.

Wiring Symbols

The report of the Committee on Wiring Diagrams lists graphical symbols for electrical diagrams with a recommendation they be accepted for criticism, use and inclusion in the Manual next year. The standards are based on those of the American Standards Association and American Institute of Electrical Engineers. Where not identical with ASA and AIEE symbols, the letter T follows the reference number of the symbol. Symbols with the suffix T are primarily intended for use in lieu of alternate symbols on diagrams for rolling stock or traction equipment. The report was presented by C. W. Martin, B&O.

Car Maintenance Problems Studied

The Committee on Car Electrical Equipment reports several roads are modifying clutches in service so that a static test can be made by using the holder and a power wrench without dismantling. Spicer is equipping new clutches with slotted weights and modified housings so "T" hooks can be used to move the weights to the service position. Considerable discussion was had as to the relative merits of static and dynamic tests with no definite conclusions reached. The dynamic test, using a standard generator regulator set at 37.5-volts open voltage, with current coil disconnected and varying the load manually, appeared to be more an overload test of the generator than it did of the clutches. Two tachometers were not available to determine the slip under load conditions. The report states: "It is not intended to show the value of a dynamic test for clutches to detect their full torque rating, nor is it to indicate any preference of one type test over another. However, it does show that a dynamic test arrangement can be developed to indicate whether clutches will perform as intended for the service in which they are used on a railroad passenger car since it has been established that generator overloads will, in most cases, damage the generator before the clutch plugs release. If it is desired to make a torque capacity rating of the clutch dynamically, it definitely would require more extensive equipment."

Loss of belts on cabooses equipped with belt drive has apparently been solved by a belt guard developed by the D&RGW. Prior to application of this guard, the road averaged less than 30 days per belt set and inspection of the belts recovered showed them in perfect condition, indicating losses were resulting from belts peeling off on curves. Since installation of the guard, records show first belt replacements were made after about 7½ months' service. The wear pattern indicated that belts had probably reached the end of their useful life. Mr. Starr, D&RGW, said that in slow speed and curvature, the retainer prevents the belt from lifting up on the small pulley. Mr. Russell, GN, said a turned axle pulley mounting works satisfactorily.

Test applications of permanently attached trainline jumpers have progressed to a point where it is felt such application is practical, not too difficult, relatively inexpensive, and service results are satisfactory. Original application on four cars (both ends) on the GN are still in service. The report stresses the importance of not leaving the connector dangling.

Of the various devices tried on passenger cars to obtain modulation of charging voltage through battery temperature, it appears that the mercury tube and thermistor types are most practical and produce the best results. One thermistor applied to a 41-plate, 64-volt battery (new in June 1955) in August 1956 was tested after 54 months and the capacity was close to 100 per cent. One railroad using mercury type control indicated an average of about 60 days between flushing periods, and another reported 90 days. Two of the battery manufacturers will drill and tap one cover in each set of batteries so the devices can be applied. They are not interchangeable.

Mr. Russell, GN, proposed an assignment which was passed, to compile specific instructions for machinists on how to turn commutators. The report was presented by T. G. Isel, Pullman Company.

Refrigeration Equipment

The Committee on Air Conditioning and Refrigeration lists several types of temperature controls for mechanical refrigerator cars and discusses difficulties had with each, together with solutions to the various problems. A recommended practice for cleaning air conditioning condensers on passenger cars was submitted for letter ballot action. This method can be used on Frigidaire full flooded vertical, Safety full flooded horizontal, and Frigidaire full flooded horizontal condensers. J. L. Christen, Pullman Co., said that the Safety company's condenser, when located in vertical position with water spray is extremely difficult to clean.

Also for letter ballot action, a schedule has been prepared covering inspection and maintenance of the heating feature of air conditioning systems on passenger cars.

Subjects include Vapor Zone heating, Fulton-Sylphon heating and Minneapolis-Honeywell heating. A new two-fold 8x11 in. car record card, expanded to cover both air-conditioning and electrical equipment on passenger cars is a letter ballot item. The card will cover a three-months' period on the basis of trip or weekly, monthly and periodic inspection and maintenance procedures. Railroads can adopt this basic form to suit conditions.

The committee has prepared comprehensive procedures for pressure test, evacuation and charging mechanical refrigeration systems, and for cleaning refrigerant lines of mechanical refrigeration system. J. V. Dobbs, SF, in discussing these reports said it is of prime importance to follow the procedures given. It will improve performance and decrease maintenance. In cleaning the refrigerant lines, the procedure given is not quick or easy. If the cleaning is done in five days, it is a good normal time. The report was presented by W. A. Woodworth, SP.

Wire Specifications

The Committee on Wire Cable and Insulating Materials recommends the report on wire and cable for use on locomotives and cars, and the specfication for polyvinyl chloride tape be submitted for letter ballot action. Interim standards are listed for Thermoplastic insulated wire and cable. Under new types of insulating materials, the SF is reported using an electrical rubber compound insulation which can be sprayed on from pressure containers. The insulation is rated at 850 volts/ mil, is oil-proof and resistant to moisture, acids and alkalies. It is used on small motors, coils, train control coils, inside of terminal boxes, plug connectors, and places where there is a chance of moisture.

The Committee's recommendation of AAR Specification 579 covering extra flexible welding cable for permanently attached trainline jumpers led to considerable discussion. R. H. Russell, GN, said he didn't feel that welding cable is quite proper for the application. Mr. Isel, Pullman, said it was very expensive and quite flexible. R. I. Fort, IC, said that while the welding cable does not have insulation, it does have a neoprene jacket which is OK for the low voltage requirements and the flexibility is quite acceptable. He pointed out that use in jumper service was not as severe as the punishment the cable takes in normal use. In the absence of F. T. Snider the report was presented by R. C. Welsh, Jr., PRR.

Television Power

The Committee on the Application of Radio and Communication Systems reports no new types of conversion apparatus for communication radio power supply in the past year. There have been instances where conventional conversion apparatus has been satisfactory for mobile radio-telephones, car lighting and other purposes but has failed to meet the requirements for a television receiver. This has specific reference to supply for a broadcast television receiver on an office car.

One railroad reports this problem where the TV sets are operated from motor-alternators that furnish 117-volt, a-c, 60-cycle single phase power, the same used to operate standard AM radios and two-way FM radio-telephones, lights, etc. The frequency variation from 60-cycles resulted in poor TV performance. The vertical modulation due to timing on the horizontal sweep that was being varied by the frequency variations from 60-cycles was corrected by the use of a magnetic amplifier speed regulator designed for the motor-alternator. The regulator is a static magnetic amplifier type with the motor main shunt field connected through compensating resistors and an adjustable resistor to the d-c supply line. Constant speed and frequency are obtained by a self-adjusting current obtained from frequency sensitive magnetic amplifier circuit which, being rectified, is fed into a "bucking" field of the motor. The regulator gets its power from the generator output. The report was presented by P. B. Burley.

Truck Reclamation

The report of the Committee on Welding and Cutting opens with a discussion of proposed revisions of Rule 23 of the Interchange Rules. Interpretation of the rule relating to heat treatment required by Grade C cast alloy steel truck side frames after repair by welding in shaded areas (journal box and brake hanger bracket, Fig. 14) was requested by the Mechanical Division and also the Joint Committee on Welding. The Committee agreed that truck side frames of Grade C steel must be preheated before any welding is done to guard against crack formation. After welding in the shaded areas, the weld must be relieved by local heating. An exception is after pedestal liners, since stress relieving of the liner welds will destroy the hardened condition of the liners. Normalizing of the side frames is not necessary after any welding is done in the shaded areas, but should be mandatory following all welding outside of these areas.

The Committee also has proposed additions to Rules 22 and 23 regarding location of ground connections when welding on cars. The connections must be made in such a way that the journal bearings cannot become part of the welding circuit This will prevent possible arcing inside the bearing with resultant damage.

The report contains a comprehensive revised recommended practice for reclaiming used couplers and yokes. Another effective method of cleaning couplers is mentioned. Sand blasting, reported three years ago as being the only fully satisfactory method, has been objectionable because of cost, special facilities required and prohibited in some states. This alternate method consists of heating the parts in a furnace to 1400-1500 deg F, followed by air cooling and wire brushing. The report was presented by Max Herzog, Frisco.

Costs Point to Electrification

Following up last year's broad outline of the factors involved in the general economics of railway electrification, the committee's report discusses maintenance and repair costs of road locomotives in much more detail. Charts of total railway operating expense and total operating expense of road locomotives for 30 years, starting in 1925 show (1) maintenance of equipment has been between 28 and 23 per cent during this period and (2) repair costs, with the exception of several years before and after World War II the largest item of expense of operating road locomotives. A chart comparing road locomotive repair costs at 1953 price level shows electric costs average from 6 cents per 1,000 hp-mile at two years' service life to 18 cents at 30 years' service life. Diesel costs on the same basis, run from 7 cents at one year's service life to a spread of 34 cents from 5 to 17 years' service life. An engineering study made in 1955-6 found the economic life of diesels in road service was less than 14 years, about 12.5 average, and about 18 years' average for diesels in yard service. More than 20 per cent of all units now in service were acquired before 1948, and 60 per cent of those now in service were built between 1948 and 1951. Since the economic life is determined by the rate of rise of repair costs, the diesel has the shortest economic life of any type of motive power. Between 1965 and 1970, it is estimated that nearly 80 per cent of diesel road locomotives should be replaced on the basis of economics. Nearly $2 billion is involved in this replacement. The committee concludes that where traffic is dense and a large number of motive power units are involved, the total capital outlay for electric locomotives and associated fixed property can possibly be less, or no more, over a 30-year period than that required for two sets of diesel power. Electrification warrants careful consideration by those carriers having dense traffic and important replacement of motive power to consider by 1965.

In the development of up-to-date schedule of fees for occupancy of railroad right-of-way by electric and communication companies, the committee recommended as a letter ballot item, that the present policy and schedule of fees dated February 20, 1958, of the Eastern Railroad President's Conference be followed with some modification.

A method to reduce cost of electrification maintenance was reported by the Committee covering a tower car developed by the Virginian (N&W) for use with motor car operation inspection equipment. The equipment consists of three units, a motor car with cab enclosure for riding space, a track trailer for materials and tools, and the collapsible tower car with elevating insulated platform. The design of the tower car is unusual in that it permits inspection of the catenary system with the wire energized, believed to be the first in use on a 11,000-volt, a-c contact wire system.

Actual building of monorail systems and its adoption as a standard is still waiting engineering analysis of many claims and counterclaims and a convincing full scale demonstration. Two basic types—the split girder and the Alweg supported type—are being compared with the conventional two-rail arrangement for rapid transit in Los Angeles and San Francisco. The report was presented by L. B. Curtis, PRR.

(Turn to page 48)

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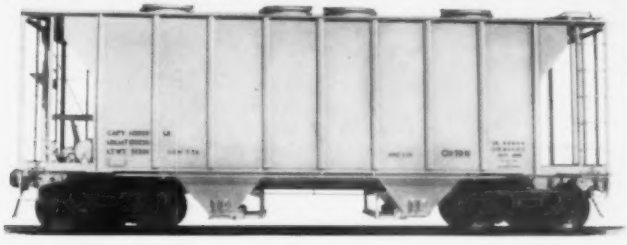

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AAR Electrical Section

Coal Transportation Costs Studied

Volume coal transportation rates reported last year have been approved by the ICC. These rates, which were allowed pending investigation for the so-called fuel year beginning April 1, 1959, apply on bituminous coal shipped from Pennsylvania, West Virginia, Virginia and Kentucky to 48 electric generating stations of 13 public utility companies located at Atlantic seaports. It was estimated that a traffic of 10 million tons of coal representing a gross revenue in excess of $40 million would have been lost to the railroads without these rates, largely as a result of displacement of coal by oil. The rates have convinced one utility not to build a mine-mouth plant. This was reported by the Committee on Relations with Public Utilities, presented by E. M. Hastings of the C&O.

A request at last year's meeting for a comparison of the cost of transporting coal by pipeline with transporting coal by rail was expanded to include cost of hauling by trucks. The Cleveland Electric Illuminating Co. reports a cost of 2.7 cents per ton mile for trucking coal for a 140 mile haul. The railroad rate between the same two points at the time trucking was started was 3.2 cents per ton-mile for a 95.3 mile haul. The trucks were able to compete because the rail rate for that particular haul was disproportionate to the distance. Trucking is contracted with a private company operating as an intrastate carrier. The committee reports pipeline rates for moving coal are not available at this time.

Of interest from both a trucking and a mine-mouth operation, the report calls attention to a new plant built by TVA at Paradise, Ky., containing a 600,000-kw GE unit, the largest scheduled for production to date. Under a TVA contract with Peabody Coal Co., for 65 million tons of coal over a 17-year period, coal will be trucked from 5 to 9 miles at a delivered cost of $2.95 a ton. This cost is about one-fourth less than the average cost of coal delivered to other TVA steam plants.

The Committee reports a study of higher voltage problems will be conducted over a three-year period by General Electric with seven cooperating suppliers and 15 major American and Canadian utilities.

Electric Heating

The Committee on Electric Heating lists changes in Section 11 (Electric Heating) for letter ballot action. In parallel on the same page are changes made from the previous text. Another manual change includes revised information on thawing of frozen water pipes by electricity and precautions to be taken. Little use of infra-red heating for preheating pinion gears before removal is reported. The induction type equipment is still in use and satisfactory. The committee reports a trend to discard heating and return to mechanical means, by using the hydraulic float-off method.

An application of metal sheathed tubular infra-red heaters for thawing coal at the Cleveland Electric Illuminating Company's station at Avon, Ohio, is described. Although in service for a short time, tests indicate this operation should process 12 cars of 70 tons each per hour, using 2.7 kw per ton of coal. Considerably more information is needed on heating of propane tanks for isolated stationary installations, especially as to just what loads are to be supplied from the propane tanks and under what conditions. Heating the propane is necessary to increase the rate of transfer of the liquid propane through the reducing valve. Vaporizers have been designed for this service, including hot water, direct fired units and electric strip heaters.

The Committee reports the results of a questionnaire sent to 79 railroads operating in the snow belt covering annual operating experience with various makes of electric snow melters for track switches. No reports were received from three railroads, and 43 reported no use of electric heaters. Of the 33 railroads reporting, a total of 6454 tubular, 3675 pad and 411 hairpin heaters are in use. In general, the large users are satisfied with their performance.

The report includes a summary of the various types of electric space heating and the economic factors involved. Two examples of buildings heated entirely by electricity are given—a school and a signal tower. The report states: "The economics of electric heat, as compared to a fuel-fired system from the consumer's standpoint, involves more than a comparison of annual operating costs. In new construction, electric heat costs include additional electric capacity and circuits, the cost of heaters and controls, and extra insulation. If ceiling cable is used with dry-wall construction, the second layer gypsum board should be charged to the heating system. Conventional fuel system costs include the heating apparatus and controls, necessary ductwork and electrical circuits, fuel storage facilities and piping, registers, radiators, or other room outlets, the chimney and connecting piping. Items common to both are the maintenance of the apparatus and space occupied. Initial costs must be projected throughout the life of the mortgage and interest charges added. A rigid analysis of these costs can yield a dollars-and-cents comparision of the two systems under consideration." The report was presented by L. B. Curtis, PRR, in the absence of Mr. Cross.

Across-Line Starting

The Committee on Motors and Controls calls attention to reduced voltage starting and recommends that it is more desirable when permissible to use the less costly and more trouble-free across-the-line starting rather than the complicated reduced voltage equipment. Limitations imposed by most power companies on current drawn during motor starting periods vary depending on the system capacity or required closeness of voltage control. Three general types of reduced voltage starting equipment are available: (1) step resistance starters, (2) auto transformer starters and (3) increment starter and motor combinations. Both step resistance and autotransformer types are suitable for reciprocating compressors except that the latter is used only when sufficient torque can be supplied at the reduced voltage to permit motor starting. This starter is frequently not acceptable on network systems, even when the motor starts and accelerates at reduced voltage because the circuit is disconnected and reconnected in changing the full voltage, causing disturbance in the line and objectionable light flicker. A number of starter and motor combinations are now available. In each case these are part winding motors and step type starters. Resistances or transformers are not used.

The report outlines two principal arrangements of electronic track scales—a straight electronic scale with the load cells placed directly under the weigh-bridge, without levers and the conventional scale with electronics interposed between the weigh-bridge, and the lever system. The second arrangement is particularly suitable for installation on existing beam scales, and permits the scale to be manually operated in event of electric component failure.

Resuscitation Method

The Committee on Safety reports a new method of artificial resuscitation which appears to completely revolutionize the whole field of activity. Called rescue breathing, or the mouth to mouth method, its basic principle is that the lungs of the rescuer temporarily supply air to the rescued by breathing directly into his lungs. The advantages of this method are its availability, and it produces as much as 12 times the volume of air as usually obtained by even skilled persons using the older methods. Less physical effort is required by the rescuer. A 20-min film described and illustrated the method.

Improved Illumination

The Committee on Illumination reports continued improvements by the lamp manufacturers in the quality and efficiency of their products. Some mercury lamps are now rated at 9,000 to 10,000 hr of economic life, a 50 per cent increase. Fluorescent lamps are available that produce as much as 15,000 lumens; in others, the color is improved and light output increased. Filament lamp improvements include a 10 per cent gain in lumens for the same wattage, and 20 per cent more light on the working surface, these attributable to bulb shape, filament and mount design changes. Two new lamps are described, the F-40 fluorescent for universal use in preheat or rapid start fixtures, and a Quartzline incandescent lamp employing the iodine cycle. The latter is applicable to classification and hump yards, shops with high bay areas, traveling cranes, protective and decorative lighting.

A new lighting system on the Erie in its 14th St. freight house at Chicago is described. It is an unusual installation in that it utilizes a combination of self-contained reflector filament luminaires and slimline fluorescent luminaires.

Buckeye.. Pioneers in design and production of Cast Steel

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Standard practice at Buckeye is to thoroughly gauge all yokes to meet the rigid A.A.R. tolerances. All Buckeye A.A.R. yokes meet the requirements of specification M-207, latest revision.

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The Substitute Locking Pin

By Gordon Taylor

This note tells why you cannot be careless about substituting diesel parts without causing delays or failures. As many of you know, the EMD traction-motor reversers are provided with a locking pin, Part No. 8041586, which locks the reverser in neutral. When not in use, this locking pin is stored in a position at the top of the left side of the reverser. When it is to be used, it is moved to the right side of the reverser and screwed into a threaded hole, blocking the reverser drum in its neutral position. This is done when a diesel unit is being prepared for movement dead in a train.

So you may identify this pin, let's say that its shank has the appearance of a ½-in. machine bolt which is threaded for about ¾-in. On the other end of the locking pin is a bar at right angles which forms a handle. The length of the locking pin is about 7 in. The important thing about the locking pin is that its threaded portion is about ¾ in. in length.

A careless maintainer misplaced the regular reverser locking pin of a road freight unit. Long afterward, the pin was found on the floor of the high-voltage cabinet.

To replace the lost pin, Careless Carl substituted a common ½-in. bolt 7 in. long, with a threaded portion 1⅝-in. in length. This was stored in the usual place on the left side of the reverser. Apparently, Carl was careful not to screw the bolt in too far when it was stored on the left side.

Later, orders were issued to ship the unit dead from one terminal to another for a new service assignment. The bolt substituting for the missing locking pin was moved to the right side of the reverser to block it in neutral position.

When the unit arrived at its new terminal, it was prepared for service. This meant, among other things, moving the substitute locking pin back to its regular storage position on the left of the reverser. Apparently, the maintainer who prepared the unit for service paid no attention to the substitute pin. In any event, he did put it back in the storage position.

The unit was now coupled as a trailing unit of a two-unit locomotive. No one checked the locomotive controls before dispatching it for service. The stage was now set for the last act of our comedy of errors. The locomotive had proceeded only a short distance when it was found that the trailing unit was not loading up. A considerable amount of time was lost before the cause of trouble was found.

Finally, the engineman discovered that the reverser on the rear unit would not move away from the neutral position. It was then found that the "reverser locking pin" was an ordinary bolt which was in the conventional storage position at the left side of reverser. The bolt, with its extra threaded length, had been screwed in too far so that it fouled the reverser drum shaft, *holding the reverser in neutral.*

After the bolt was backed out a few turns, it released the reverser. The freight train resumed its trip and went through without further incident. The delay report reached the mechanical department with no delay. The lost locking pin was found and put back in its accustomed position. The bolt was removed so it could cause no more delays. Careless Carl was never found.

The lessons to be learned from this episode are:

- If reverser locking pin is dropped or lost, make a real effort to find it.
- If it becomes necessary to make an emergency replacement of a locking pin, be certain that the substitute will not foul the reverser in running position.
- When preparing diesel units for service, be certain that they will load properly before they are permitted to leave the terminal.

This series of articles is based on actual experiences of men who operate and maintain diesel-electric locomotives.

Special Draw-Bar Sling recommended for handling cars by coupler shank.

Braided Safety Sling with Patented Twin Thimble.

Diesel Car Wheel Sling with legs of unequal length to balance load.

Yellow Strand Braided Safety Slings are available in practically any length and number of parts, with scores of different fittings.

Handle any size, shape, weight of lift with maximum safety and ease

Machined parts, any size, weight or shape – massive forgings and assemblies weighing hundreds of tons: practically anything you have to lift on the railroad can be handled better and safer with Broderick & Bascom Braided Safety Slings! We can supply you with an unlimited variety of specialized wire rope slings, each one capable of doing its job better than any other type of sling.

These are extremely flexible slings with the strength of Yellow Strand, flexibility comparable to manila rope. For special requirements, they are available with high strength "POWERSTEEL."

Most important, Yellow Strand Braided Safety Slings are designed for your specific application by B & B sling specialists and built by skilled master craftsmen.

For that extra margin of confidence on all your lifting jobs, call our nearest branch, or our Engineering Department. *Broderick & Bascom Rope Co., 4203 Union Boulevard, St. Louis 15, Mo.*

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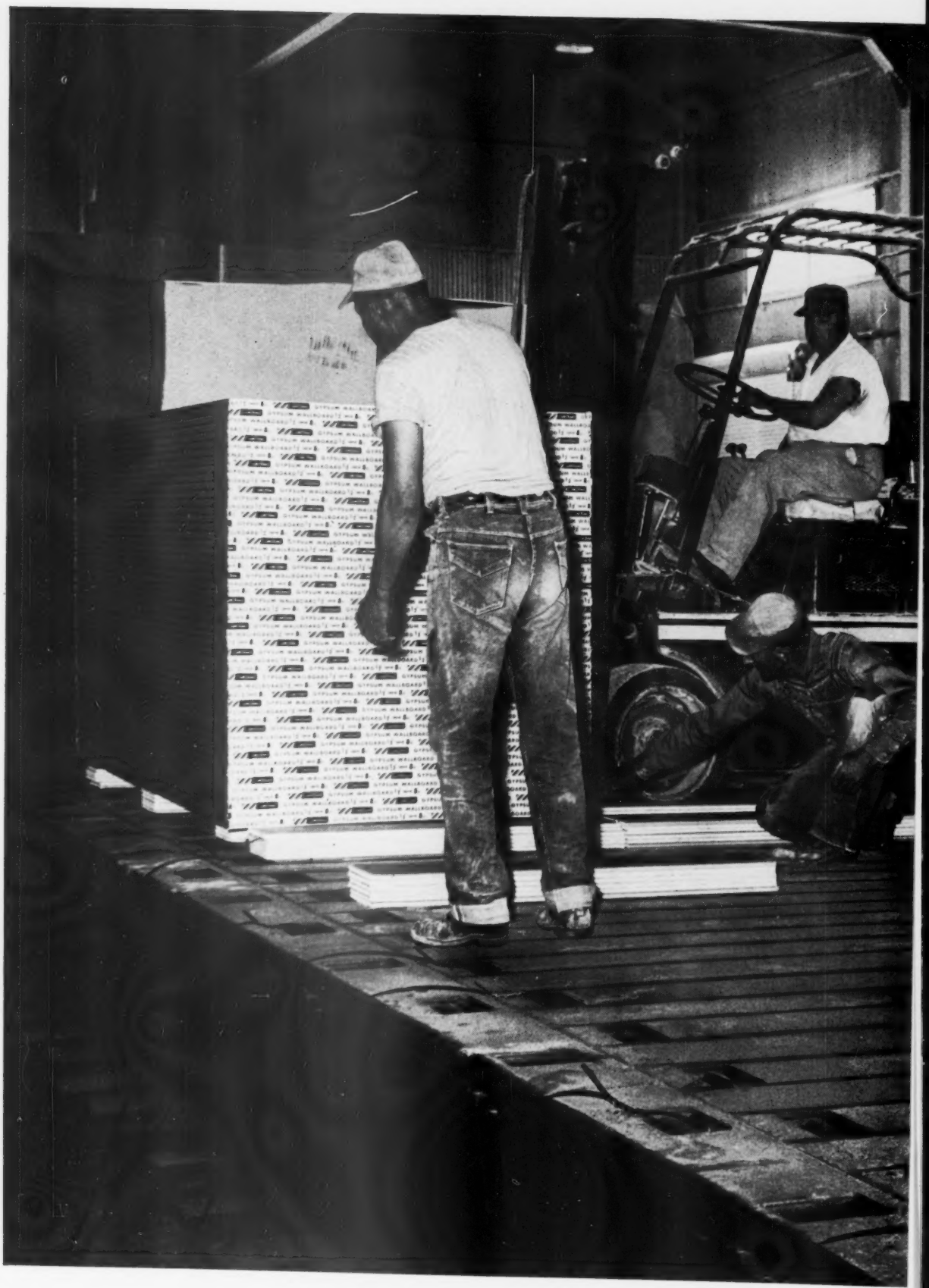

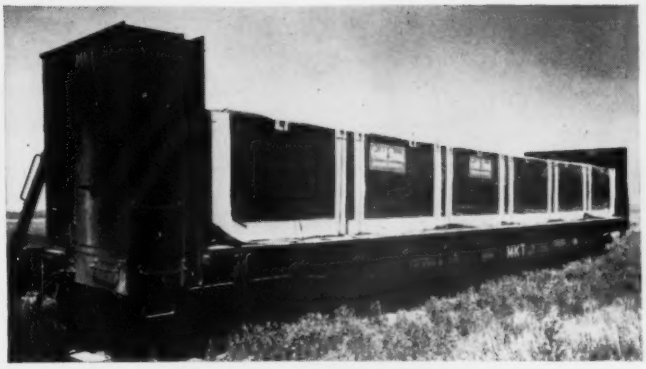

N-S-F® KEEPS FLATCARS CLASS A, READY FOR SAFE, EASY LOADING

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Now Gold Bond Gypsum Wallboard goes to market the modern way. Here's how. Straps are attached to recessed lading anchors along the sides of an M-K-T flatcar equipped with NAILABLE STEEL FLOORING. The load is set in place, covered with weatherproof plastic and strapped down tightly. It's quick, safe and economical. Lift trucks move easily over the durable, anti-skid floor that's never weak or splintered. N-S-F, welded directly to the underframe, actually adds structural strength throughout the M-K-T car—keeps it in Class A condition and helps eliminate claim damage.

It's no wonder that—for more than 13 years—progressive shippers and railroads alike have recognized that N-S-F makes cars more rugged, more serviceable, more versatile.

Full information and cost studies are available from Stran-Steel representatives in Chicago, New York, Philadelphia, St. Louis, San Francisco, Minneapolis and Atlanta. In Canada, N-S-F is made and sold by International Equipment Co., Ltd., Montreal. STRAN-STEEL CORPORATION, Detroit 29, Michigan.

Stran Steel® N-S-F

STRAN-STEEL IS A DIVISION OF **NATIONAL STEEL CORPORATION**

Personal Mention

Boston & Maine. — *Boston:* STILLMAN G. STANLEY, project supervisor, appointed engineer motive power and car equipment. FRANK G. FOWLER, mechanical inspector, appointed supervisor motive-power standards. JAMES A. HESELTON, district general car foreman, appointed assistant superintendent car maintenance. *Boston Engine Terminal:* WALLACE H. CHAPLIN, general foreman, appointed assistant superintendent locomotive maintenance. HUGH W. STILLINGS, assistant general foreman, appointed general foreman. LLOYD H. KIERSTEAD motive-power inspector, appointed assistant general foreman. *Billerica, Mass.:* CLARENCE W. MCELROY appointed superintendent of Billerica shops. Formerly master mechanic, Boston Division. *Greenfield, Mass.:* WALTER E. TRUE appointed assistant superintendent of locomotive maintenance. Formerly general foreman at East Deerfield. *East Deerfield, Mass.:* PHILIP G. BUKER, assistant general foreman, appointed general foreman. THOMAS W. AIREY, district general car foreman, appointed assistant superintendent car maintenance.

Chesapeake & Ohio.—*Russell, Ky.:* R. G. BIAS appointed general foreman, car shop, succeeding E. I. ELLIS, retired. *Richmond, Va.:* F. C. CARR, JR., appointed assistant supervisor diesel locomotives. *Charlottesville, Va.:* C. A. KRAFT appointed general foreman, succeeding J. C. LARAMORE, retired.

Chicago & North Western.—*Chicago:* GERALD M. WOLLARD appointed mechanical inspector—car.

Milwaukee. — *Milwaukee, Wis.:* D. D. FISHER appointed assistant superintendent car department. *Tacoma, Wash.:* J. D. O'NEILL appointed district general car foreman, succeeding Mr. Fisher. Mr. O'Neill formerly general car foreman at Chicago.

Mississippi Central. — *Hattiesburg, Miss.:* S. J. MASSEY, JR., appointed superintendent, with jurisdiction over transportation and mechanical departments.

New Haven.—*New Haven:* Title of R. H. DAVIS, mechanical superintendent, changed to general mechanical superintendent.

Norfolk & Western.—*Crewe, Va.:* WILLIAM B. TANNER, assistant road foreman of engines, appointed assistant general air-brake inspector. *Petersburg, Va.:* E. HAROLD FARISS appointed general foreman. *Winston-Salem, N.C.:* WARNER F. OLIVER appointed general foreman, succeeding Mr. Fariss. *Lamberts Point, Va.:* JOHN L. SHOW appointed enginehouse foreman. Formerly foreman at Petersburg. *Bluefield, W. Va.:* S. JACK DEMPSEY, appointed assistant car foreman, succeeding Mr. Oliver. RAY S. WOODSON succeeds Mr. Dempsey as gang foreman. *Schaeffers Crossing, Roanoke, Va.:* CARL F. KRIPPENDORF, shop inspector, appointed gang foreman, succeeding Mr. Woodson. *Clare, Ohio:* PAUL J. BARRY appointed general foreman, suc-

ceeding Percy C. Jenkins, retired. *Columbus, Ohio:* ZEIGE Z. SMALLEY, appointed assistant car foreman, succeeding Mr. Barry. V. THOMAS WRIGHT, JR., shop inspector, appointed gang foreman, succeeding Mr. Smalley.

Ontario Northland.—*North Bay, Ont.:* R. O. BEATTY, assistant road foreman of engines, appointed road foreman of engines, succeeding J. H. Legary, retired.

Soo Line.—*Minneapolis, Minn.:* D. L. BORCHERT appointed mechanical superintendent, succeeding C. F. GUGGISBERG, retired.

Supply Trade Notes

TIMKEN ROLLER BEARING CO.—*H. J. Urbach,* executive engineer, now director of engineering. *Ralph E. McKelvey,* assistant chief engineer of the Physical Laboratories, appointed assistant director of engineering.

■

DOW METAL PRODUCTS CO., DIVISION OF DOW CHEMICAL CO.—*Robert E. Bockrath* assigned to a new group responsible for developing aluminum and magnesium applications in railroad industry. Headquarters Midland, Mich.

■

DOMINION BRAKE SHOE CO.—*John A. McVicker* elected vice-president in general charge of railroad products.

■

PYLE-NATIONAL CO.—*Ralph Eads Co.,* appointed sales representative for Pyle-National products in Texas. *Ralph Eads* and *O. E. Lundelius, Jr.,* will cover territory from Houston, and *Jack C. Holland* will cover territory from Dallas.

■

OAKITE PRODUCTS, INC.—*Lon E. Welch,* representative in Akron, Ohio, transferred to Kokomo, Ind., replacing *Daniel B. Lamb* now manager of company's Detroit division. *George E. Park* assigned to field service staff at Springfield, Mo.

■

EX-CELL-O CORP.—*Edwin P. Nelson* appointed district manager, New York-Philadelphia area office, with headquarters in Springfield, N. J. Mr. Nelson formerly in charge of sales office in Milwaukee, Wis.

■

SPRAGUE DEVICES, INC.—*William DeCapua* named vice-president and director, serving in engineering, production, and sales.

■

PEERLESS EQUIPMENT CO., DIVISION OF POOR & CO.—Address now Railway Exchange building 80 East Jackson Boulevard, Chicago 4.

■

KOPPERS CO.—*Robert H. Devine* appointed assistant vice-president in the Wood Preserving Division. Mr. Devine will continue also as assistant to division general manager.

■

VASCOLOY-RAMET CORP.—*Harold Hauck,* district supervisor of sales, Indian-

TAKE A NEW LOOK!

HERE'S HYATT'S NEW TAPER FREIGHT BEARING!

PROVED DESIGN Hyatt engineers adhered to established principles of successful taper roller bearing construction in designing this new taper freight car bearing. Many refinements have been incorporated for improved performance. For instance, the new seal has been proved satisfactory in hundreds of thousands of miles of trouble-free service.

EXHAUSTIVELY TESTED Hundreds of Hyatt's new taper freight bearings were tested in especially designed machines under radial and thrust loads and speeds far in excess of actual service conditions. Only when they out-performed the exacting bench marks set for approval were they released for production.

COMPLETELY RELIABLE Installed on high speed runs in piggy-back service and on covered hopper cars, these new Hyatt taper freight bearings have been averaging 10,000 trouble-free miles a month.

A.A.R. APPROVED The Association of American Railroads research and mechanical departments have successfully tested the Hyatt taper freight car bearing and approved its use in interchange operations. A.A.R. approval number "6" has been assigned to our taper bearing.

AVAILABLE NOW Production quantities of the new Hyatt taper freight bearing are being produced every month in the well equipped Hyatt railroad bearing plant at Clark, New Jersey.

HYATT *HY-ROLL BEARINGS* **FOR NON-STOP FREIGHT**

GM GENERAL MOTORS

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION • HARRISON, NEW JERSEY

apolis area, appointed to newly created position of assistant sales manager, in charge of Railroad Tooling, with headquarters in Waukegan, Ill.

■

COLORADO FUEL & IRON CORP. — *Floyd O. Johnson, Jr.*, railroad sales engineer, appointed assistant to general manager, railroad sales, at Denver, Colo.

■

JOHNS-MANVILLE CORP.—*M. W. Burleson* appointed general sales manager, Industrial Insulations Division.

■

UNITED SHOE MACHINERY CORP.—*Charles F. Buehring* appointed district representative, South Pacific region, POP Rivet Division.

■

MOTOR COILS MANUFACTURING CO. —Motor Coils announces a unit exchange program to give railroads in a 400-mile radius of Pittsburgh 24-hr service on traction motor needs. Forty-eight to 72-hr delivery is promised to those outside the 400-mile radius. Stock pile of units ready for exchange are Westinghouse 370's, 362's and 471's; EMD D-27's, D-47's and D-12's; GE 752's, 731's and 581's.

■

AMERICAN BRAKE SHOE CO.—*Paul L. McCulloch, Jr.*, appointed group executive of newly formed *Industrial Castings Group* composed of American Manganese Steel, Electro-Alloys, Engineered Casting, and National Bearing Divisions. Mr. Culloch elected also a vice-president of company.

OBITUARY

DAYTON A. BRUNDAGE, sales representative, Vapor Heating Corp., died July 5 in Passavant Hospital, Chicago.

HELPS FROM MANUFACTURERS

The following compilation of literature — including pamphlets and data sheets—is offered free to railroad men by manufacturers to the railroad industry. To receive the desired information write direct to the manufacturer.

VOLTAGE REGULATOR. Bulletin GEA-7068 gives detailed information on new GE transistorized static voltage regulator. Describes how electrical components are card mounted, placing functional circuits on separate, easily removed cards. (Write: *General Electric Co.*, Dept. RLC, Schenectady 5, N. Y.)

RESILIENT MOUNTINGS. Bulletin No. 908, "Lord Product Guide," includes general design, application and performance data on resilient mountings and mounting systems for vibration, shock and noise control. (Write: *Lord Manufacturing Co.*, Dept. RLC, Erie, Pa.)

ULTRASONIC CLEANING. 11-page "Primer of Ultrasonic Cleaning" describes in layman's terms how and why ultrasonic cleaning works, its advantages, purpose of detergent, etc. (Write: *Turco Products, Inc.*, Dept. RLC, 24600 S. Main st., Wilmington, Cal.)

CARBON ARC WELDING. Instruction manual describes the operation and use of the carbon arc welding process and illustrates applications of the twin electrode torch. (Write: *Arcair Co., Dept. RLC, P.O. Box 431, Lancaster, Ohio.)*

LIFTING JACKS. 4-page booklet covers complete line of lifting jacks—hydraulic, ratchet lowering, journal, push and pull types, etc. (Write: *Duff-Norton Co.*, Dept. RLC, 4 Gateway Center, Pittsburgh 22, Pa.

HAND TOOLS. 16-page catalog No. H-9 illustrates and describes a wide variety of ters, socket and tool sets, tool chests, etc. (Write: *Owatonna Tool Co.*, Dept. RLC, 679 Cedar st., Owatonna, Minn.)

SPRINGS. 8-page guide, "Alco Springs for Industry," contains formulas, drawings, data and illustrations for all types of hot- and cold-wound springs, also a section outlining working stress, and modulus and design stress of springs. Dept. 906-R, *Alco Products*, Dept. RLC, Box 1065, Schenectady, N. Y.

ROLLER BURNISHING TOOLS. Bulletin RB-17 lists tool sizes and specifications for line of adjustable roller burnishing tools. Write: *Gustav Wiedeke Co.*, Dept. RLC, 1833 Richard st., Dayton 1, Ohio.)

Flat-Back Bearings

(Continued from page 33)

of water and dirt entry and oil loss. This is certainly a definite approach to hot-box elimination.

"In choosing between the journal stop and the flat-back bearing, the flat-back bearing appears to be the most economical. It is a simpler approach, eliminating added components in the box, bolted, welded, or attached to some type of support. Maintenance would be reduced by removing the need to tighten up bolts and shimming to take up accumulated wear on the stops."

On the N&W, no hot-box has been experienced with any flat-back bearing. Early in 1960, inspections were made of all the boxes on 32 of these 100 cars—a total of 256 boxes. All bearings, wedges, seals and lubricating pads were in good condition. On 57.8 per cent of the bearings, contact area of the bearing on the journal was straight and had an average width of 3⅜ in. On the remainder, the pattern was irregular. Wear at the collar end of the bearings was very small—negligible on 175 bearings; 1/64 in. on 61 bearings; and 1/32 in. on 20 bearings.

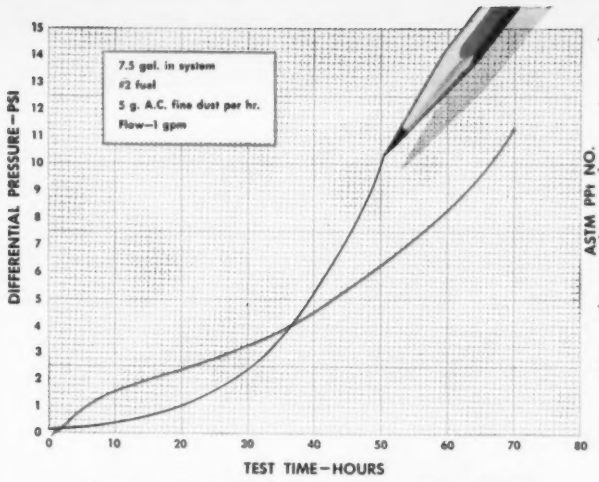
Because of an error in lug location, wear on the fillet ends of the bearings averaged just over 7/64 in., ranging from zero to 3/16 in. The error was not picked up until the bearings had been in service about a year, and in July 1959 two cars were equipped with flat-back bearings which had had their lugs correctly located. One of the cars was inspected in February 1960 after an estimated 9,500 miles. There was practically no wear on either fillet or collar end of the bearing. On the collar end, part of the babbitt flashing was still intact. The journal contact pattern was straight and averaged 3 in. in width. Faces of the bearing lugs had been making good contact with stop columns in the box.

Inspections showed that dust-guard seals after 19 months' service, as a whole, were in good condition. Twelve of the 256 showed the inner bead of foam rubber torn around the dust-guard seat, or the inner foam separating from the plywood core. Even these seals were still effective. All seals on the journal-box lids were in good condition.

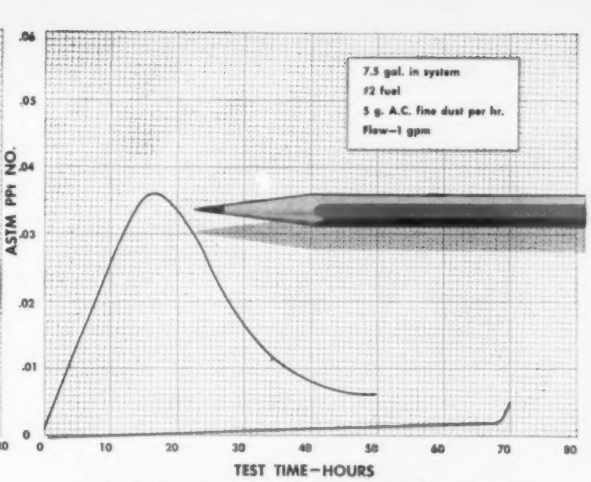
Cleanliness of the interiors of the boxes, component parts, and oil was excellent—far beyond what would normally be expected. This cleanliness is attributed to the lid seal and to the protection the flat-back bearing gives the dust-guard seal. Cleanliness and lack of wear leads N&W officers to the conclusion that these assemblies will operate four to six years before any parts will have to be renewed. During this period, the interior of the box and the oil should remain clean.

Flat-back bearings are being applied to 1,000 70-ton hopper cars being constructed at Roanoke. The cars are being equipped with several kinds of dust guard seals and lubricators. Box lids also have seals. Ends of the wedges are being machined to provide full end contact and prevent skewing of the bearing on the journal. Two hundred 70-ton hopper cars being built at Princeton will also be equipped with flat-back bearings. The AAR has given approval for 800 of these 1,200 cars to be stencilled for a four-year repack.

The flat-back design is authorized for interchange service on 6,000 freight cars and at least 18 railroads are now conducting tests.



Showing comparative flow rate of Conventional Cotton (black line) and New WIX P-1 Porosite (red line) Second Stage Fuel Filters. With 10 psi the condemnation peak, note that the old style cartridge has a service life 16 hours less than that of the New WIX P-1 Cartridge.



This chart exposes the comparison of oil filtration efficiency. Note the unfavorable peak registered by the Standard depth-type Filtrant. Also note that the oil filtered by the WIX P-1 Filtrant never showed more than trace amounts of contamination over its longer life.

New Developments in Diesel Fuel Filtration Promise Improved Performance PLUS Economy

Shown above is the WIX Filter Prescription for trouble-free Diesel Fuel. At the left — WIXITE Primary Fuel Filter Cartridge. At the right — the New WIX P-1 Pleated Paper Second Stage Fuel Filter Cartridge whose outstanding performance is shown in the charts above.

Diesel Fuel Filtration is a vital cost factor. Over $37,000,000 is the figure set as the avoidable annual cost of dirt in Railroad Diesel engines in 1956. That is the cost in wear and repair alone. It doesn't take into account the additional costs such as: down time of units; delays, disruption of schedules and related losses due to mechanical failures.

WIX Prescription Filtration is a positive, practical answer to this staggering cost factor. WIX research has developed Filter Cartridges for Primary and Second Stage Fuel Filtration that, combined, provide revolutionary results for many Railroads. WIX also offers dramatic new filtering efficiency for Diesel Lubrication. These advances are important to you . . . write for particulars today.

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WIX CORPORATION (Industrial Division).
GASTONIA, N. C. Dept. RLC

Please send me the new WIX catalog and complete information on new developments in:

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WESTINGHOUSE ReManufactured "AB" BRAKE EQUIPMENT

ReManufactured with STANDARD WARRANTY

- UPGRADES BRAKE EQUIPMENT
- SIMPLIFIES CAR REBUILDING PROGRAM
- OFFERS SAVINGS IN COST OF NEW CAR CONSTRUCTION
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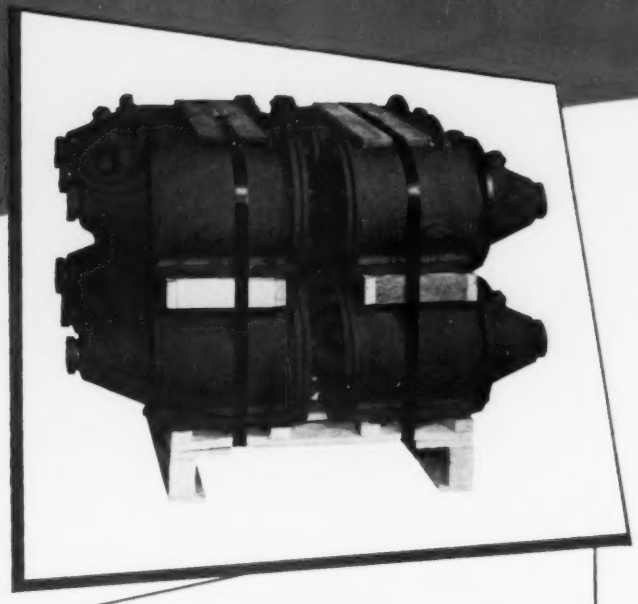

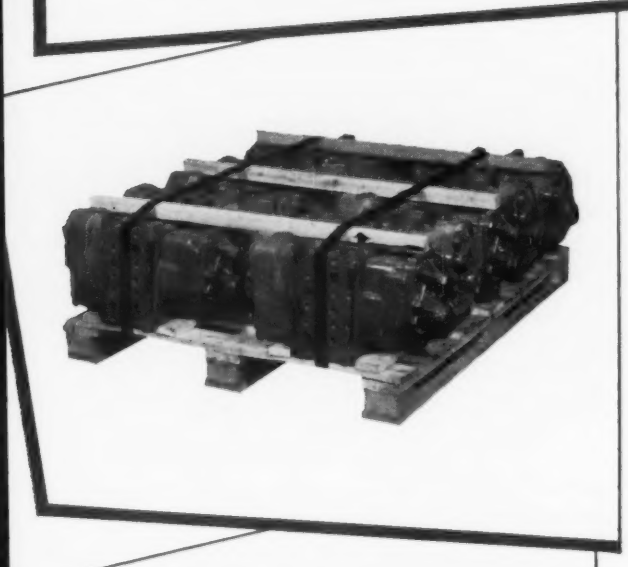

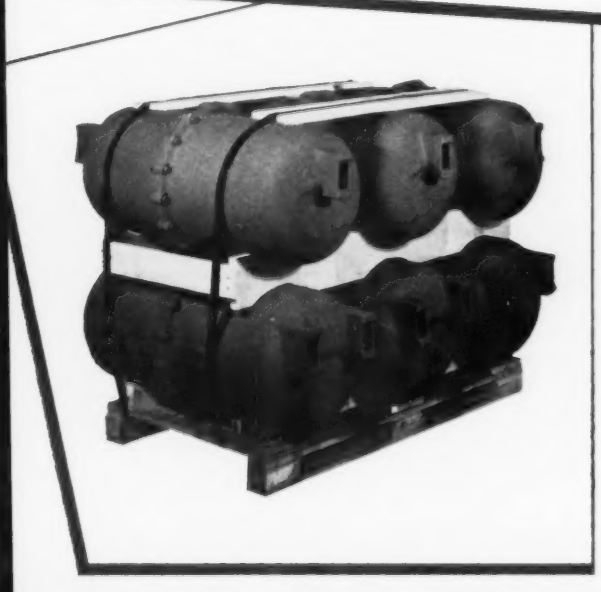

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Wheel Tread Defects

(Continued from page 35)

the steel. In full-scale tests, it has been shown that the residual tensile stresses developed in Class CR wheels on cooling after a single brake application simulating an emergency service stop are sufficient to cause the formation of sudden-type thermal cracks. In Class BR and Class AR wheels under similar braking conditions, sudden-type thermal cracks form as the result of the gradual build-up of these stresses during repeated brakings. It appears that the carbon content is a major factor in the susceptibility of wheels to sudden-type thermal cracking.

Fatigue-Type Cracks

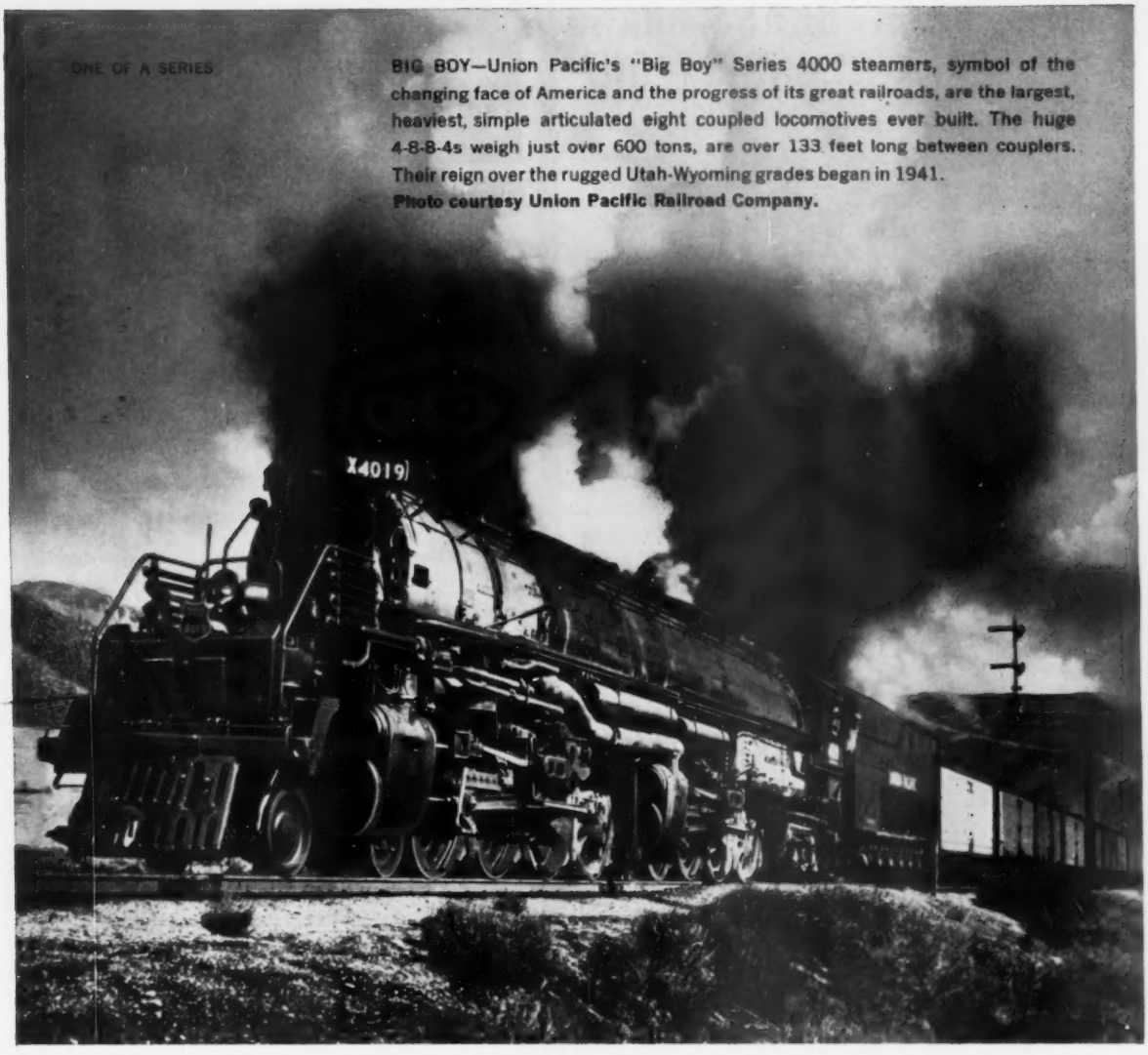
Although fatigue-type thermal cracks propagate as deeply as sudden-type thermal cracks, they form much more slowly. This type of cracking, which usually occurs in wheels under multiple-unit cars or under switcher locomotives, is associated with frequent brakings of relatively low energy dissipation. These cracks usually originate near the front edge of the tread on wheels when an overhanging brake-shoe condition exists, or at the tip of the flange on wheels on which flange-type brake shoes are used. Although the cracks sometimes occur in the area of greatest wheel-rail contact of the tread, they are less frequently observed at this location.

The appearance of the fracture surface of fatigue-type cracks is characterized by progression rings typical of fatigue failures. The shape of the progression rings indicates that the cracks start at finite points at the surface, probably at thermal checks. Usually less than 1/16 in. of metal at the tread surface of wheels that contain fatigue-type thermal cracks has been heated to temperatures above the lower transformation temperature of the steel, which fact indicates that the amount of energy dissipated during each brake application is relatively small.

Other investigators have recognized the existence of this type of cracking in stainless steels and in alloys used in high-temperature applications. It has been assumed that fatigue-type thermal cracking is caused by cyclical thermal stresses developed by alternate heating and cooling.

Fatigue-type thermal cracks in the

(Continued on page 65)



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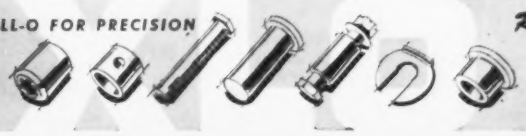

Railroad Division

EX-CELL-O CORPORATION
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Wheel Tread Defects

(Continued from page 62)

rims of wheels are apparently caused by cyclical stresses produced from the thermal gradients developed during repeated brake applications. The formation of these cracks is believed to be independent of the stresses produced by rolling loads, inasmuch as most of the cracks start at the tip of the flange where the wheels do not contact the rail, or near the front edge of the tread where rail contact is infrequent.

Explosive Failure

The explosive failure of a wheel falls into the category of violent brittle fracture. Explosive failure is relatively infrequent, because a thermal crack must usually be present to act as a stress raiser before this type of failure will occur. It is of interest to note that either sudden-type thermal cracks or fatigue-type thermal cracks can initiate or trigger explosive failure.

It is known that explosive-type failure is most likely to occur when a wheel cools after prolonged drag braking. Under these braking conditions, the rate of energy dissipation is relatively low, but the duration of braking is such that the rim of the wheel is heated to a considerable depth. Thus, the stresses induced by plastic deformation from thermal expansion are large. For this reason, it is believed that the elevated-temperature strength, the notch toughness, and the initial residual stress level are the primary factors that influence resistance to explosive failure.

This premise has led to testing several wheels made of alloy steels with elevated-temperature tensile properties and ductility-transition temperatures superior to those of the regular wheel-steel classes. The results of full-scale braking tests on these alloy-steel wheels have confirmed the indicated importance of these factors, in that the wheels had both superior resistance to sudden-type thermal cracking and to explosive failure. Unfortunately, however, service tests indicated that the alloy-steel wheels studied to date were only slightly more resistant to fatigue-type thermal cracking than were carbon-steel wheels.

Investigations of a number of these wheel defect phenomena are currently under investigation at the United States Steel Research Center.

ADVERTISERS IN THIS ISSUE

IN ARMCO WHEELS . . .

FORGING AND ROLLING MAKE THE DIFFERENCE

TYPICAL PROPERTIES OF AS-CAST INGOT VS. FORGED AND ROLLED WHEELS

		CARBON (%)	0.2% YIELD STRENGTH (PSI)	TENSILE STRENGTH (PSI)	ELONGATION (%)	REDUCTION IN AREA (%)	IMPACT STRENGTH (FT-LB)
Non-heat-treated	As-Cast Ingot	.75	50,000	105,000	5	5	6
	One-Wear	.70	73,000	131,000	12	23	21
	Class U	.71	67,000	124,000	16	24	22
Heat-treated	Class A	.52	86,000	132,000	20	43	53
	Class B	.62	108,000	149,000	17	46	55
	Class C	.70	128,000	169,000	15	32	36

Tensile Specimens: .250"d x 1" gage length. Duplicate tests from rim.
Impact Specimens: Std. Charpy with 1 mm radius x 1 mm deep notch. Triplicate tests from rim.

This table of properties for as-cast ingots compared with wrought steel wheels gives an idea of the big difference forging, rolling and heat-treating make.

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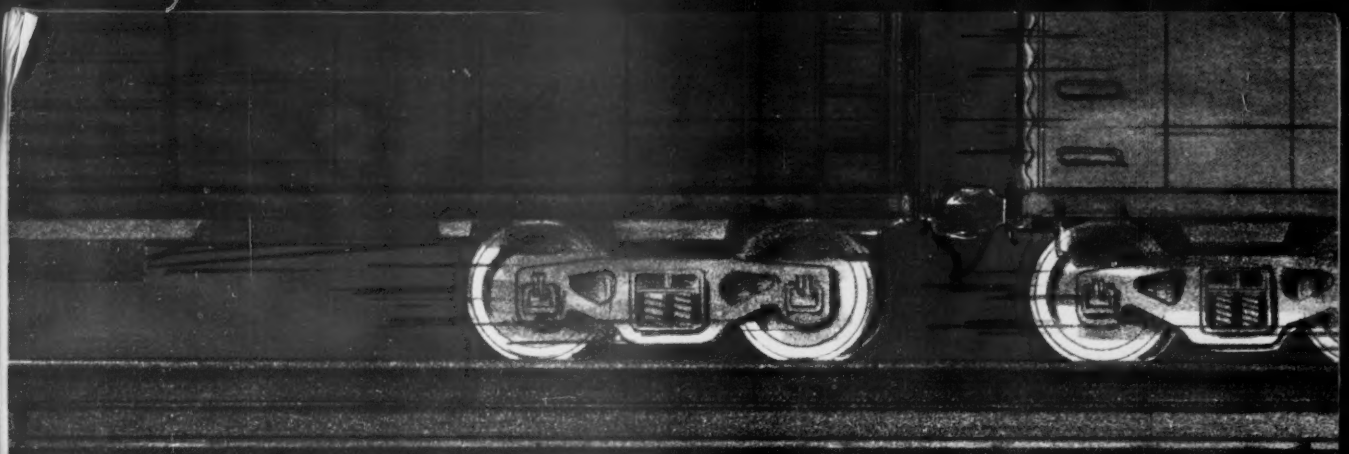

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